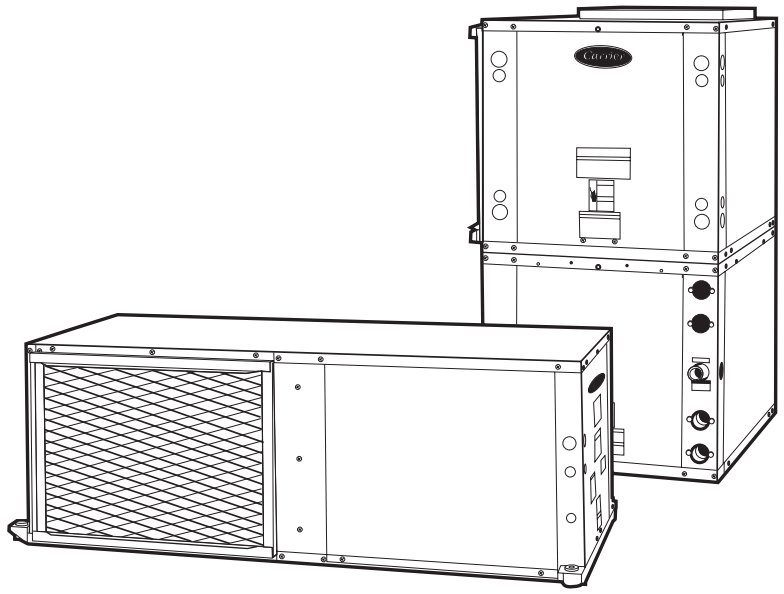
Carrier®

Product Data

50RHC, 50RVC Standard Efficiency Water Source Heat Pumps

Horizontal — 1 1/2 to 5 Nominal Tons
Vertical — 1 1/2 to 5 Nominal Tons

AQUAZONE™



ASHRAE 90.1 COMPLIANT

Single-Package Horizontally and Vertically Mounted Water Source Heat Pumps with Electronic Controls.

- Compact cabinet design
- Performance certified to ASI/ISO/ASHRAE 13256-1
- Waterloop (boiler/tower) application use with an operating temperature range of 60 F to 95 F
- Simplified refrigeration circuit provides efficient and reliable refrigerant flow
- Mute package available for quiet operation
- Three service panels for compressor section for easy maintenance
- Meets new ASHRAE 90.1 performance requirements
- Backward compatibility for replacing older Carrier and other manufacturers' units
- Flexible and reliable controls accommodate all systems

Features/Benefits

Carrier's Aquazone™ standard efficiency water source heat pumps are an efficient, compact alternative for all boiler/tower and retrofit applications

Operating efficiency

Carrier horizontal and vertical water source heat pumps are designed for quality and high performance over a lifetime of operation. Aquazone standard efficiency units offer cooling EERs to 13 and heating COPs to 4.6. Efficiency ratings stated are in accordance with standard conditions under ISO (International Organization for Standardization) Standard 13256-1 and provide among the highest ratings

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in the industry, exceeding ASHRAE (American Society of Heating, Refrigerant and Air Conditioning Engineers) 90.1 Energy Standards.

High quality construction and testing

All units are manufactured to meet extensive quality control standards. An automated control system provides continuous monitoring of each unit and performs quality control checks as equipment progresses through the production process. Standard construction features of the Carrier Aquazone™ units include:

Cabinet — Heavy gage galvanized sheet metal cabinet construction enables part standardization (i.e., minimal number of parts) and modular design. Cabinet interior surfaces are lined with $^1/_2$ in. thick, $1^1/_2$ lb. acoustic type insulation. Sheet metal surfaces are treated for maximum corrosion protection to ensure resilience for long term vitality. Compact cabinet dimensions fit tight space limitations in both horizontal and vertical configurations.

Compressor — Aquazone standard efficiency units include a reciprocating compressor in sizes 018 through 060. Compressors are mounted on an isolated system (i.e., from the cabinet) that maximizes vibration isolation and minimizes transmission to the unit structure.

Blower and motor assembly — Permanent split capacitor (PSC) three-speed blowers are provided with all units to satisfy many air distribution applications. Blower upgrades are available for high static conditions. Fan speed control allows reduced sound operation. Blowers also provide dehumidification control with the correct controller option. Blower motors operate at lower temperatures to help improve the reliability of the water source heat pump.

Refrigeration/water circuit — Units have a sealed refrigerant circuit including a reciprocating compressor. Simplified refrigerant circuits provide easy maintenance, higher accuracy and excellent performance. Also standard are a reversing valve (4-way valve), water-to-refrigerant coaxial (tube in tube) coil, and enhanced aluminum fin/rifled copper tube air to refrigerant heat exchanger coil.

ARI/ISO — Aquazone units have ARI (Air Conditioning & Refrigeration Institute)/ISO, NRTL (Nationally Recognized Testing Lab), or CSA (Canadian Standards Association) labels and are factory tested under normal operating conditions at nominal water flow rates. Quality assurance is provided via testing report cards shipped with each unit to indicate specific unit performance under cooling and heating modes. Water source heat pumps are New York City MEA (Materials Equipment and Acceptance) 60-00-E rated.

Quiet operation

Fan motor insulation and compressor springs provide sound isolation, cabinets are fully insulated to reduce noise transmission, low speed blowers are used for quiet operation through reduced outlet air velocities, and air-to-refrigerant coils are designed for lower airflow coil face velocities.

Design flexibility

Airflow configurations for horizontal units are available in four patterns including left or right return, and left, right, or back discharge. Horizontal units are field convertible from left or right discharge to back discharge. Vertical units are available in four airflow patterns including top discharge with front, right or left return. Standard water temperature range between 60 F and 95 F offers maximum design flexibility for boiler/tower applications. Water flow rates as low as 1.5 gpm per ton assist with selection from a various range of circulating pumps. Factory-installed options are offered to meet specific design requirements.

Safe, reliable operation

Standard safety features for the refrigerant circuit include a high-pressure switch, low-pressure sensor to detect refrigerant loss and low air temperature sensor to safeguard against freezing. Equipment safety features include water loop temperature monitoring, voltage protection, water coil freeze protection, and standard electronic condensate overflow shutdown. All safety features are tested and run at the factory to assure proper operation of all components and safety switches.

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NRTL/C

As an ENERGY STAR® Partner, Carrier Corporation has determined that this product meets the ENERGY STAR guidelines for energy efficiency.

Features/Benefits (cont)

All components are carefully designed and selected for endurance, durability, and carefree day-to-day operation.

The Aquazone™ unit is shipped to provide internal and external equipment protection. Shipping supports are placed under the blower housing and compressor feet. In addition, horizontal and vertical units are both mounted on oversized pallets with lag bolts for sturdiness and maximum protection during transit.

Ease of installation

The Aquazone unit is packaged for simple low cost handling and require minimal installation. All units are prewired and factory charged with refrigerant. Horizontal units include factory-installed hangar isolation brackets. Vertical units have an internally trapped condensate drain to reduce labor associated with installing an external trap for each unit. Water connections (FPT) and condensate drains (FPT) are anchored securely to the unit cabinet.

Simple maintenance and serviceability

The Aquazone WSHP units are constructed to provide easy maintenance. All units allow access to the compressor section from 3 sides and have large removable panels for easy access. Additional panels allow access to the blower and control box sections.

The blower housing assembly can be serviced without disconnecting ductwork from the dedicated blower access panel. Blower units come with permanently lubricated bearings for worry-free performance. Blower inlet rings allow blower wheel removal without having to remove the housing or ductwork connections.

Electrical disconnection of the blower motor and control box is easily accomplished via quick disconnects on each component.

Easy removal of the control box from the unit provides access to all refrigeration components.

The refrigeration circuit is easily tested and serviced through high and low pressure ports integral to the refrigeration circuit.

Maximum control flexibility

Aquazone water source heat pumps provide reliable control operation using a standard microprocessor board with flexible alternatives for many direct digital control (DDC) applications including the Carrier Comfort Network (CCN) and open protocol systems.

Carrier's Aquazone standard unit solid-state control system, the Complete C, provides control of the unit compressor, reversing valve, fan, safety features, and troubleshooting fault indication features. The Complete C is one of the most user friendly, low cost, and advanced control boards found in the WSHP industry. Many features are field selectable to provide the ultimate in field installation flexibility. The overall features of this standard control system include:

50VA transformer — Assists in accommodating accessory loads.

Anti-short cycle timer — Provides a minimum off time to prevent the unit from short cycling. The 5-minute timer energizes when the compressor is deenergized, resulting in a 5-minute delay before the unit can be restarted.

Random start relay — Ensures a random delay in energizing each different WSHP unit. This option minimizes peak electrical demand during start-up from different operating modes or after building power outages.

High and low pressure refrigerant protection — Safeguards against unreliable unit operation and prevents refrigerant from leaking.

Condensate overflow sensor — Electronic sensor mounted to the drain pan. When condensate pan liquid reaches an unacceptable level, the unit is automatically deactivated and placed in a lockout condition. The sensor recognizes 30 continuous seconds of overflow as a fault condition.

High and low voltage protection — Safety protection from excessive or low voltage conditions.

Automatic intelligent reset — Unit shall automatically restart 5 minutes after shutdown if the fault has cleared. Should a fault occur 3 times sequentially, lockout will occur.

Accessory output — 24 V output is provided to cycle a motorized water valve or damper actuator with compressor in applications such as variable speed pumping arrangements.

Performance Monitor (PM) — Unique feature monitors water temperatures to warn when the heat pump is operating inefficiently or beyond typical operating range. Field selectable switch initiates a warning code on the unit display.

Water coil freeze protection (selectable for water or antifreeze) — Field selectable switch for water and water/glycol solution systems initiates a fault when temperatures exceed the selected limit for 30 continuous seconds.

Air coil freeze protection (check filter operation) — Field selectable switch for assessing excessive filter pressure drop. The switch initiates a fault when temperatures exceed the selected limit for 30 continuous seconds.

Alarm relay setting — Selectable 24 V or pilot duty dry contact for activating a remote alarm.

Electric heat option — Output provided on the controller for operating two stages of emergency electric heat.

Service test mode with diagnostic LED (light-emitting diode) — The Test mode allows service personnel to check the operation of the WSHP and control system efficiently. Upon entering Test mode, time delays speed up, and the Status LED flashes a code to indicate the last fault experienced. This mode provides easy fault diagnosis; based on the fault code that the status LED flashes, Carrier troubleshooting tables provide easy reference to typical problems.

LED visual output — An LED panel indicates high pressure, low pressure, low voltage, high voltage, air/water freeze protection, condensate overflow, and control status.

Features/Benefits (cont)

Carrier PremierLink™ controller adds reliability, efficiency, and simplification

The PremierLink direct digital controller can be ordered as a factory-installed option. Designed and manufactured exclusively by Carrier, the controller can actively monitor and control all modes of operation as well as monitor the following diagnostics and features: unit number, zone temperature, zone set point, zone humidity set point, discharge air temperatures, fan status, stages of heating, stages of cooling, outdoor-air temperature, leaving-air temperature, leaving water temperature, alarm status, and alarm lockout condition.

This controller has 38.4K baud communications capability and is compatible with *Comfort*Link™ Controls, CCN and ComfortVIEW™ Software. The Scrolling Marquee and Navigator are optional tools used for programming and monitoring the unit for optimal performance. Adding the Carrier CO_2 sensor in the conditioned space provides ASHRAE 62-99 compliance and Demand Control Ventilation (DCV). A DCV control strategy is especially beneficial for a water source heat pump system to minimize the energy used to condition ventilation air. In combination with energy efficient Aquazone units, DCV may be the most energy efficient approach ever developed for a water source heat pump system.

The PremierLink peer-to-peer, Internet ready communicating control is designed specifically for CV (Constant Volume) and VVT® (Variable Volume/Variable Temperature) applications. This comprehensive controls system allows water source heat pumps to be linked together to create a fully functional HVAC (heating, ventilation, and air conditioning) automation system.

Model number nomenclature

50RHC,RVC STANDARD EFFICIENCY

50RH C 018 S C C 3 0 1 3 0

Aquazone™ Water Source Heat Pump
50RH – Horizontal Configuration
50RV – Vertical Configuration

Efficiency Type
C – Standard efficiency

Size – Nominal Tons
018 – 1-1/2
024 – 2
030 – 2-1/2
036 – 3
041*– 3-1/2
042 – 3-1/2
048 – 4
060 – 5

Airflow Configuration

50RHC Units

Code	Return	Discharge
S	Left	Right
E	Left	Back
Z	Right	Left
B	Right	Back

50RHC-High Static Units

Code	Return	Discharge
D	Left	Right
F	Left	Back
A	Right	Left
C	Right	Back

50RVC Units

Code	Return	Discharge
†F	Front	Top
L	Left	Top
R	Right	Top

50RVC-High Static Units

Code	Return	Discharge
M	Left	Top
G	Right	Top
†H	Front	Top

Controls
C – Complete C Microprocessor Control
D – Deluxe D Microprocessor Control
****P –** PremierLink™ DDC Control

Water Circuit Options
0 – None

Operating Range
3 – Standard Range (60 to 95 F)
4 – Standard Range (60 to 95 F) with Mute Package

Packing
1 – Single Pack

Revision Code
0 – Current Revision

V-Ph-Hz
1 – 575-3-60
3 – 208/230-1-60
4 – 265-1-60
5 – 208/230-3-60
6 – 460-3-60

Heat Exchanger
C – Copper
N – Cupro-Nickel

*Vertical only.
†Available in sizes 018-030 only.
**Available with Complete C only.

Options and accessories

Factory-installed options

Cupronickel heat exchangers are available for higher corrosion protection for applications such as open tower, geothermal, etc. Consult the water quality guidelines for proper application and selection of this option.

Sound attenuation package (mute package) is available for applications that require especially low noise levels. With this option, a double application of sound attenuating material is applied to the internal divider, side panels, top and bottom panels. The mute package in combination with standard unit noise reduction features (i.e., as mentioned previously) provides sound levels and noise reduction to the highest degree.

High static blower is available in all sizes for the 50RHC,RVC units. This option specifically increases airflow at various static pressure conditions, providing even more flexibility to Carrier's high blower performance offered by the standard models.

Deluxe D control system provides the same functions as the Complete C control system while incorporating additional flexibility and functions including:

Thermostat input capabilities — Accommodate emergency shutdown mode and night setback with override (NSB) potential. Night setback from low temperature thermostat with 2-hour override is initiated by a momentary signal from the thermostat.

Compressor relay staging — Used with dual stage units (units with 2 compressors and 2 Deluxe D controls) or in master/slave applications.

Boilerless electric heat control system — Allows automatic changeover to electric heat at low loop water temperature.

Intelligent reversing valve operation — Minimizes reversing valve operation for extended life and quiet operation.

Thermostat type select (Y, O or Y, W) — Provides ability to work and select heat pump or heat/cool thermostats (Y, W).

Reversing valve signal select (O or B) — Provides selection for heat pump O/B thermostats.

Dehumidistat input — Provides fan control for dehumidification operation.

Multiple units on one thermostat/wall sensor — Provides communication for up to three heat pumps on one thermostat.

Boilerless changeover temperature — Provides selection of boilerless changeover temperature set point.

Accessory relays — Allow configuration for multiple applications including fan and compressor cycling, digital night setback (NSB), mechanical night setback, water valve operation, and outside air damper operation.

PremierLink™ controller is compatible with the Carrier Comfort Network (CCN) and other building automation systems (BAS). This control allows users the access and ability to change factory-defined settings, thus expanding the function of the standard unit.

Field-installed accessories

Carrier's line of Aquazone™ thermostats are both attractive and multi-functional, accommodating stand-alone water source heat pump installations.

Programmable 7-day thermostat — Offers 2-stage heat, 2-stage cool, auto changeover, 7-day programmable with copy command, 4 settings per day, fully electronic, 24 vac, backlit LCD, keypad lockout, no batteries required, 5-minute compressor protection, NEVERLOST™ memory, 3 security levels, temperature display in degrees F or C.

Programmable 7-day light-activated thermostat — Offers same features as the 7-day programmable thermostat. Includes occupied comfort settings with lights on and unoccupied energy savings with lights off.

Programmable 7-day flush-mount thermostat — Offers same features as the 7-day programmable thermostat and includes locking coverplate with tamper proof screws, flush to wall mount, holiday/vacation programming, set point limiting, dual point with adjustable deadband, O or B terminal, and optional wall or duct-mounted remote sensor.

Programmable 5-day thermostat — Offers 2-stage heat, 2-stage cool, auto changeover, 5-minute built-in compressor protection, locking cover included, temperature display in degrees F or C, keypad lockout, backlit display, 5-1-1 programming, O or B terminal, dual set point with adjustable deadband, configurable display, self-prompting program, 4 settings per day.

Non-programmable thermostat — Offers 2 heat stages, 2 cool stages, auto changeover, 5-minute built in compressor protection, locking cover included, temperature display in degrees F or C, keypad lockout, large display, backlit display, O or B terminal, dual set point with adjustable deadband, backplate with terminals.

Loop controller with six stages (2 stages for heating and 4 stages for heat rejection):

- Loop temperature alarms
- Two pump single loop flow monitoring with the ability to manually select the lead pump
- One common alarm signal and indicating light and one audible alarm
- Loop water temperature sensor test circuit
- Functional test simulation from operator keypad
- Real timeclock, industrial noise ratings
- Loop water temperature control switch.
- Loop controller with six stages (2 stages for heating and 4 stages for cooling)

Filter rack (2 in.) is available in place of the standard 1-in. return air filter to enhance the filtration system of the water source heat pump. The 2-in. filter rack does not include filters.

Fire-rated hoses are 2 ft long and have a fixed MPT on one end and a swivel with an adapter on the other end. Hose kits have both a supply and return hose and can be either stainless steel or galvanized. Five sizes are available ($1/2$, $3/4$, 1, $1\,1/4$, $1\,1/2$ in.).

Ball valves (brass body) used for shutoff and balancing water flow. Available with memory, memory stop, and pressure temperature ports. UL-listed brass body, ball and stem type with Teflon seats and seals. Five sizes are available ($1/2$, $3/4$, 1, $1\,1/4$, $1\,1/2$ in.).

Options and accessories (cont)

Y strainers (bronze body) are "Y" type strainers with a brass cap. Maximum operating pressure rating of 450 psi. Strainer screen made of stainless steel. Available with blow down valves. Five sizes are available ($1/2$, $3/4$, 1, $1\,1/4$, $1\,1/2$ in.).

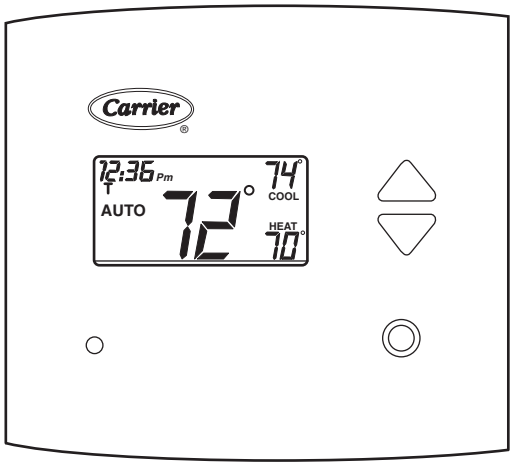
Solenoid valves (brass body) offer 3.5 watt coil, 24 volt, 50/60 Hz, 740 amps inrush, .312 amps holding. Slow operation for quiet system application. Five sizes are available ($1/2$, $3/4$, 1, $1\,1/4$, $1\,1/2$ in.).

Hose kit assemblies provide all the necessary components to hook up a water-side system. Supply hose includes a ported ball valve with pressure temperature (P/T) plug ports, flexible stainless steel hose with swivel and nipple. Return hose includes a ball valve, preset automatic balancing valve (gpm) with two P/T ports, flexible stainless steel hose with a swivel and nipple, balancing valve, and low-pressure drop water control valve.

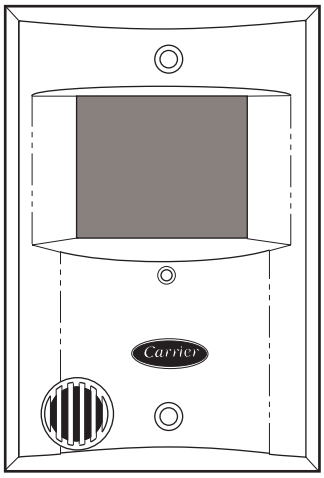
Remote sensors are available for Aquazone™ flush mount thermostats. Available for wall (wired and wireless) or duct mounted applications.

PremierLink™ accessories provide a fully integrated WSHP DDC system. Accessories include supply air temperature sensors (with override and/or setpoint adjustment), communicating room sensors, CO_2 sensors (for use in demand control ventilation), and linkage thermostats (to control multiple units from one thermostat).

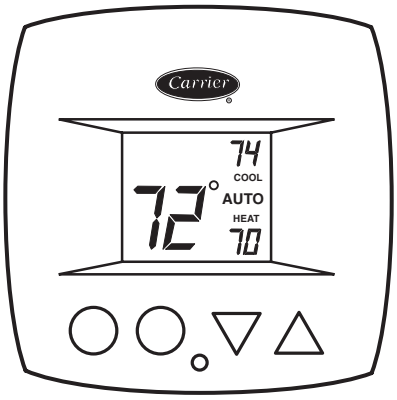
CARRIER AQUAZONE THERMOSTATS



7-DAY PROGRAMMABLE/LIGHT-ACTIVATED PROGRAMMABLE

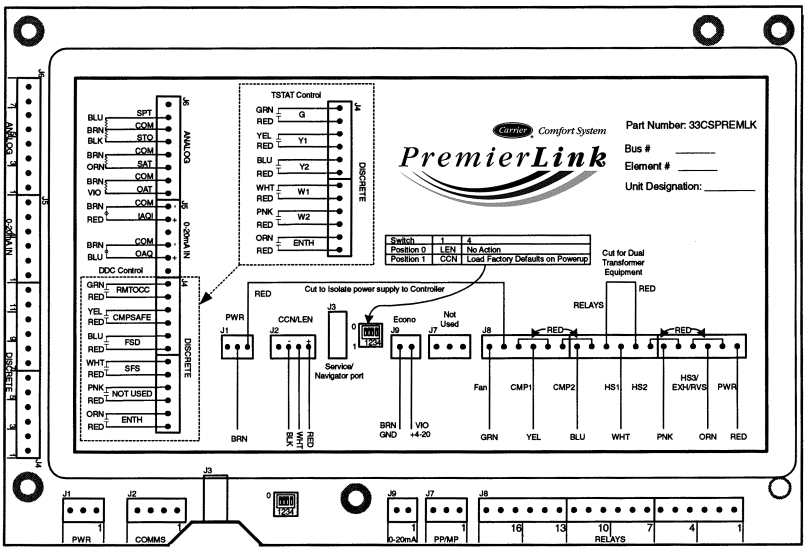


7-DAY PROGRAMMABLE FLUSH MOUNT



5-DAY PROGRAMMABLE/NON-PROGRAMMABLE

PREMIERLINK™ COMMUNICATING CONTROL



Physical data

PHYSICAL DATA — AQUAZONE™ 50RHC,RVC018-060 UNITS

UNIT 50RHC,RVC	018	024	030	036	041	042	048	060
Compressor (1 each)	Recip	Recip	Recip	Recip	Recip	Recip	Recip	Scroll
Factory Refrigerant Charge Vertical (oz)	26	38	37	42	50	51	66	74
Factory Refrigerant Charge Horizontal (oz)	25	38	37	41	50	51	66	74
PSC FAN MOTOR & BLOWER								
Fan Motor Type/Speeds	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3	PSC/3
Fan Motor (hp)	1/6	1/4	3/4	1/2	3/4	3/4	3/4	1
Blower Wheel Size (Dia x W)	8 x 7	9 x 7	9 x 7	9 x 8	9 x 8	9 x 8	10 x 10	11 x 10
WATER CONNECTION SIZE								
FPT — All Other	1/2	3/4	3/4	3/4	3/4	3/4	1	1
HORIZONTAL								
Air Coil								
Dimensions (H x W)	16 x 22	16 x 22	16 x 22	20 x 25	—	20 x 25	20 x 35	20 x 35
Total Face Area (ft²)	2.44	2.44	2.44	3.47	—	3.47	4.86	4.86
Tube Size (in.)	3/8	3/8	3/8	3/8	—	3/8	3/8	3/8
Fin Spacing (fpi)	12	12	12	14	—	12	12	12
Number of Rows	2	3	3	2	—	3	3	3
Filter Standard — 1-in. Throwaway (Qty — Size)	1 — 16 x 25	1 — 16 x 25	1 — 16 x 25	1 — 20 x 28 or 2 — 20 x 14	—	1 — 20 x 28 or 2 — 20 x 14	1 — 20 x 24 & 1 — 20 x 14	1 — 20 x 24 & 1 — 20 x 14
VERTICAL								
Air Coil								
Dimensions (H x W)	20 x 17.25	20 x 17.25	20 x 17.25	24 x 21.75	20 x 17.25	24 x 21.75	24 x 28.25	24 x 28.25
Total Face Area (ft²)	2.4	2.4	2.4	3.62	2.4	3.62	4.71	4.71
Tube Size (in.)	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8
Fin Spacing (fpi)	12	12	12	14	11	12	12	12
Number of Rows	2	3	3	2	4	3	3	3
Filter Standard — 1-in. Throwaway (Qty — Size)	1 — 20 x 20	1 — 20 x 20	1 — 20 x 20	1 — 24 x 24	1 — 20 x 20	1 — 24 x 24	1 — 14 x 24 & 1 — 18 x 24	1 — 14 x 24 & 1 — 18 x 24
Weight								
Operating (lbs)	181	189	197	203	207	218	263	278
Packaged (lbs)	186	194	202	209	212	224	270	285

LEGEND

PSC — Permanent Split Capacitor

NOTES:
1. All units have grommet compressor mountings, and 1/2-in. and 3/4-in. electrical knockouts.
2. Check serial plate for refrigerant type (R-22 or R-407C).

ARI/ISO capacity ratings

50RHC,RVC	LIQUID FLOW (Gpm)	AIRFLOW (Cfm)	WATER LOOP HEAT PUMP				GROUND WATER HEAT PUMP				GROUND LOOP HEAT PUMP			
			Cooling 86 F		Heating 68 F		Cooling 59 F		Heating 50 F		Cooling 77 F		Heating 32 F	
			TC Btuh	EER Btuh/W	TC Btuh	COP	TC Btuh	EER Btuh/W	TC Btuh	COP	TC Btuh	EER Btuh/W	TC Btuh	COP
018	4.5	600	18,200	12.3	22,000	4.2	Not Rated				Not Rated			
024	6.0	800	23,800	13.0	27,800	4.6								
030	7.5	1000	28,000	12.2	33,500	4.4								
036	9.5	1200	35,000	12.0	45,500	4.2								
041	10.5	1325	37,700	12.0	47,500	4.2								
042	11.0	1350	41,000	12.0	52,600	4.2								
048	12.0	1600	47,100	12.2	58,200	4.4								
060	15.0	2000	58,000	12.0	76,800	4.2								

LEGEND

COP — Coefficient Performance
EER — Energy Efficiency Ratio
TC — Total Capacity

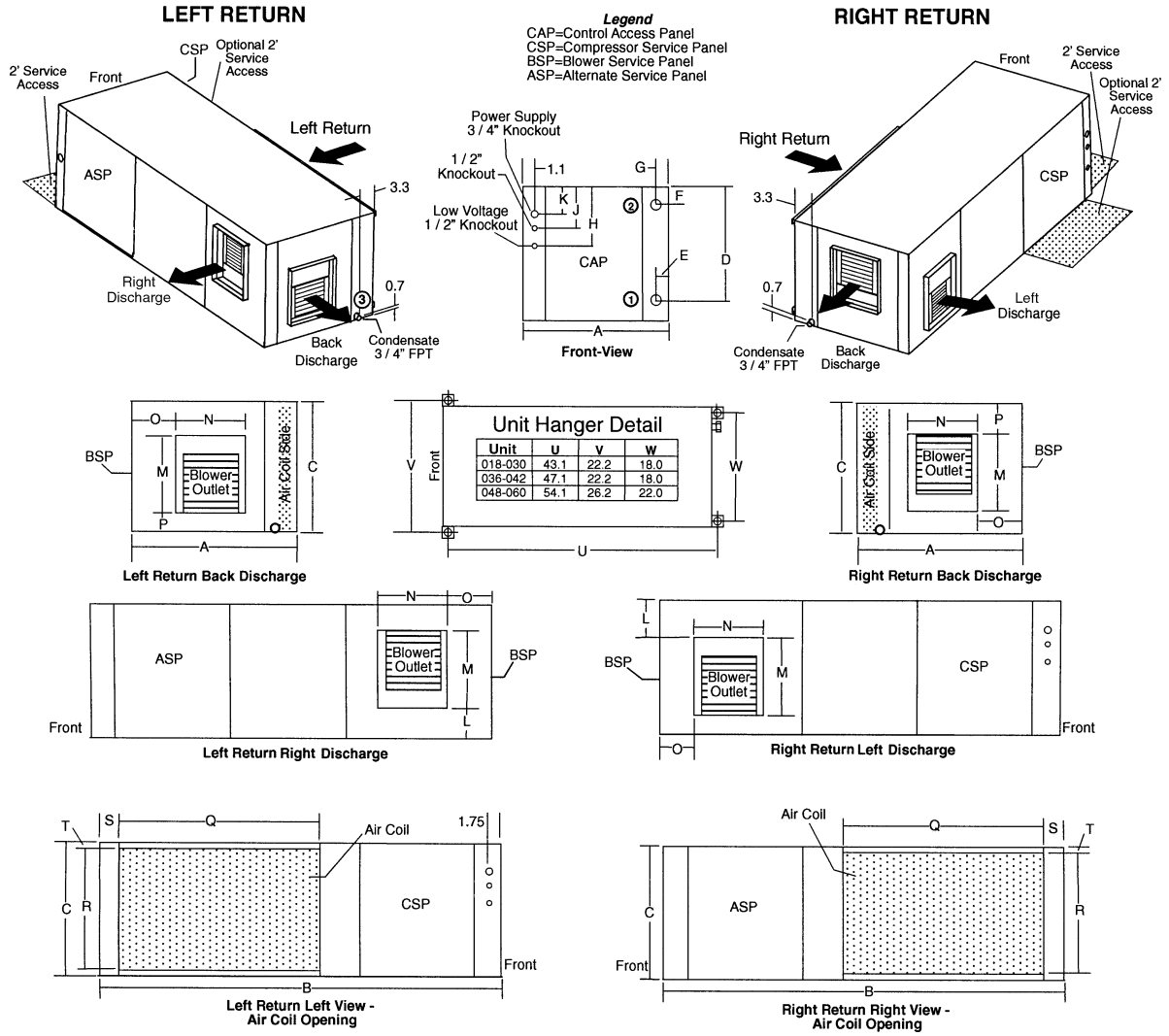
NOTES:
1. A water-to-air heat pump using water or brine circulating in a common piping loop functioning as a heat source/heat sink.
2. The temperature of the water or brine loop is usually mechanically controlled within a temperature range of 60 F to 90 F.
3. Certified in accordance with the ARI/ISO Standard 13256-1 Certification Program, which replaces ARI Standard-320.

ARI/ISO capacity notes

1. Cooling capacities based upon 80.6 F DB (dry bulb), 66.2 F WB (wet bulb) entering-air temperature.
2. Heating capacities based upon 68 F DB, 59 F WB entering-air temperature.
3. All ratings based upon 208 volt operation.

Dimensions

HORIZONTAL DIMENSIONAL DATA



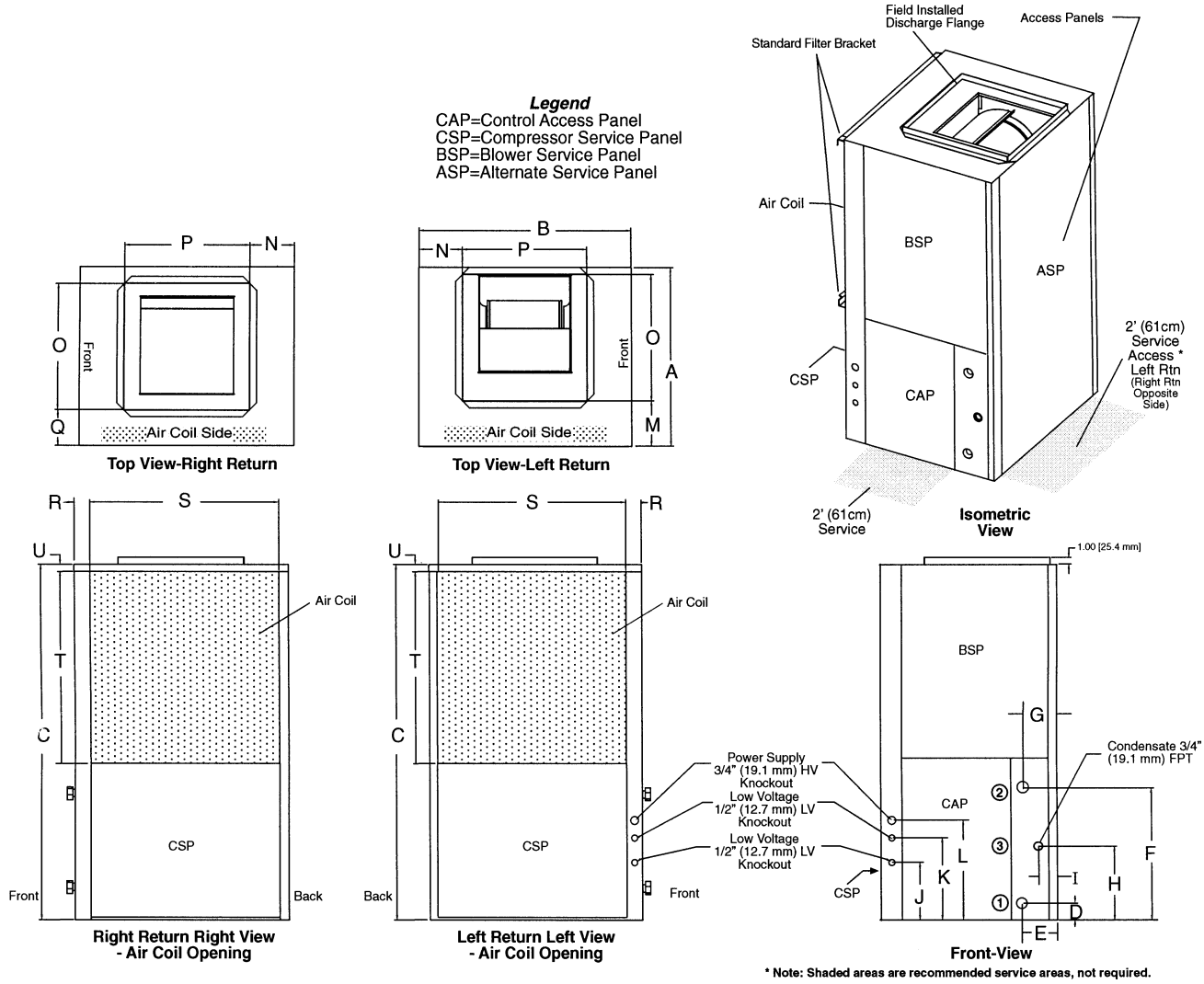
50RHC018-060 UNITS

50RHC UNIT		OVERALL CABINET			WATER CONNECTIONS				ELECTRICAL KNOCKOUTS			DISCHARGE CONNECTIONS duct flange (± 0.10 in.)					RETURN CONNECTION using return air opening			
		A Width	B Depth	C Height	1 — In		2 — Out		H 1/2-in. Cond	J 1/2-in. Cond	K 3/4-in. Cond	L	M Supply Height	N Supply Depth	O	P	Q Return Depth	R Return Height	S	T
					D	E	F	G	Low Voltage	Low Voltage	Power Supply									
018-030	in.	20.1	43.1	17.1	15.3	2.4	1.9	2.1	12.1	9.1	6.1	2.6	13.3	9.9	4.1	1.3	23.0	15.0	1.1	1.0
	cm.	51.1	109.5	43.4	38.9	6.1	4.9	5.3	30.8	23.2	15.6	6.6	33.8	25.1	10.5	3.3	58.4	38.1	2.8	2.5
036,042	in.	20.1	47.1	21.1	18.8	2.2	4.7	1.2	16.1	13.1	10.1	2.5	16.1	11.0	3.0	2.5	25.9	19.0	1.1	1.0
	cm.	51.1	119.6	53.6	47.6	5.5	11.9	3.0	41.0	33.3	25.7	6.3	40.9	27.9	7.7	6.4	65.8	48.3	2.8	2.5
048	in.	24.1	54.1	21.1	19.4	5.9	4.3	2.3	16.1	13.1	10.1	3.7	16.1	13.7	4.1	1.3	35.9	19.0	1.1	1.0
	cm.	61.2	137.4	53.6	49.2	14.9	11.0	5.8	41.0	33.3	25.7	9.5	41.0	34.8	10.3	3.2	91.2	48.3	2.8	2.5
060	in.	24.1	54.1	21.1	19.4	5.9	4.3	2.3	16.1	13.1	10.1	1.7	18.1	13.7	4.1	1.3	35.9	19.0	1.1	1.0
	cm.	61.2	137.4	53.6	49.2	14.9	11.0	5.8	41.0	33.3	25.7	4.4	46.0	34.8	10.3	3.2	91.2	48.3	2.8	2.5

NOTES:
1. Condensate is 3/4-in. FPT copper.
2. Horizontal unit shipped with filter bracket only. This bracket should be removed for return duct connection.
3. Hanger kit is factory installed.
4. Verify high static option discharge connection dimensions with Carrier.

AIRFLOW CONFIGURATION		
Code	Return	Discharge
S	Left	Right
E	Left	Back
Z	Right	Left
B	Right	Back

VERTICAL DIMENSIONAL DATA



50RVC018-060 UNITS

50RVC UNIT		OVERALL CABINET			WATER CONNECTIONS							ELECTRICAL KNOCKOUTS			DISCHARGE CONNECTION duct flange installed (±0.10 in.)					RETURN CONNECTION using return air opening			
		A Width	B Depth	C Height	1		2		3		Water FPT Size	J 1/2-in. cond	K 1/2-in. cond	L 3/4-in. cond	M	N	O Supply Width	P Supply Depth	Q	R	S Return Depth	T Return Height	U
					D	E	F	G	H	I		Low Voltage	Low Voltage	Power Supply									
					In		Out		Condensate														
018-030	in.	21.5	21.5	39.0	1.8	3.8	15.2	3.6	8.1	2.3	3/4″	4.1	7.1	10.1	6.4	3.8	14.0	14.0	5.3	2.3	18.3	20.2	0.7
	cm.	54.6	54.6	99.1	4.5	9.7	38.6	9.1	20.6	5.8	1.9	10.5	18.1	25.7	16.1	9.5	35.6	35.6	13.6	5.8	46.5	51.3	1.9
036 & 042	in.	21.5	26.0	44.0	2.0	3.7	16.2	2.6	10.4	2.3	3/4″	4.1	7.1	10.1	6.4	3.8	14.0	14.0	5.1	2.3	22.8	24.2	0.7
	cm.	54.6	66.0	111.8	5.1	9.4	41.1	6.6	26.4	5.8	1.9	10.5	18.1	25.7	16.1	9.5	35.6	35.6	13.1	5.8	57.9	61.4	1.9
041	in.	21.5	21.5	39.0	1.7	3.6	16.4	2.6	8.1	2.3	3/4″	4.1	7.1	10.1	6.4	3.8	14.0	14.0	5.3	2.3	18.3	20.2	0.7
	cm.	54.6	54.6	99.1	4.4	9.1	41.7	6.6	20.6	5.8	1.9	10.5	18.1	25.7	16.1	9.5	35.6	35.6	13.6	5.8	46.5	51.3	1.9
048-060	in.	24.0	32.5	46.0	1.8	5.9	16.7	2.3	10.1	2.3	1″	4.1	7.1	10.1	6.9	7.3	16.0	18.0	5.1	2.3	29.3	24.2	0.7
	cm.	61.0	82.6	116.8	4.5	14.9	42.4	5.8	25.7	5.8	2.5	10.5	18.1	25.7	17.4	18.4	40.6	45.7	13.1	5.8	74.4	61.4	1.9

NOTES:
1. Condensate is 3/4 in. (19.1 mm) FPT.
2. Filter bracket extending from unit 2.5 in. (6.4 cm). This bracket should be removed when connecting return duct.
3. Discharge flange field installed.

AIRFLOW CONFIGURATION		
Code	Return	Discharge
L	Left	Top
R	Right	Top

Selection procedure (with 50RHC024 example)

I Determine the actual cooling and heating loads at the desired dry bulb and wet bulb conditions.

Assume cooling load at desired dry bulb 80 F and wet bulb 65 F conditions are as follows:

Given:

Total Cooling (TC). . . . . .22,100 Btuh

Sensible Cooling (SC) . . . . . .16,500 Btuh

Entering-Air Temperature db . . . . . 80 F

Entering-Air Temperature wb . . . . . .65 F

II Determine the following design parameters.

Entering water temperature, water flow rate (GPM), airflow (CFM), water flow pressure drop and design wet and dry bulb temperatures. Airflow CFM should be between 300 and 450 CFM per ton. Unit water pressure drop should be kept as close as possible to each other to make water balancing easier. Enter the 50RHC024 Performance Data tables and find the proper indicated water flow and water temperature.

For example:

Entering Water Temp . . . . . 90 F

Water Flow (Based upon 12 F rise in temp) . . . . . 4.5 GPM

Airflow Cfm . . . . . 700 Cfm

III Select a unit based on total cooling and total sensible cooling conditions. Unit selected should be closest to but not larger than the actual cooling load.

Enter tables at the design water flow and water temperature. Read the total and sensible cooling capacities.

NOTE: Interpolation is permissible, extrapolation is not.

For example:

Enter the 50RHC024 Performance Table at design water flow and water temperature. Read Total Cooling, Sensible Cooling and Heat of Rejection capacities:

Total Cooling . . . . . .23,500 Btuh

Sensible Cooling . . . . . 17,800 Btuh

Heat of Rejection . . . . . .30,300 Btuh

Read the Heat Capacity. If the Heat Capacity exceeds the design criteria, it is acceptable.

NOTE: It is quite normal for water source heat pumps to be selected on cooling capacity only since the heating output is usually greater than the cooling capacity.

IV Determine the correction factors associated with the variable factors of dry bulb and wet bulb using the Corrections Factor tables found in this book.

Using the following formulas to determine the correction factors of dry bulb and wet bulb:

a) Corrected Total Cooling = tabulated total cooling x wet bulb correction x airflow correction.

b) Corrected Sensible Cooling = tabulated sensible cooling x wet/dry bulb correction x airflow correction

V Determine entering air and airflow correction using the Corrections Factor tables found in this book.

The nominal airflow for 50RHC024 is 800 cfm. The design parameter is 700 cfm.

700/800 = 88% of nominal airflow

Use the 88% row in the Airflow Correction table.

The Entering Air Temperature wb is 65 F. Use the 65 F row in the Entering Air Correction table.

Using the following formulas to determine the correction factors of entering air and airflow correction:

	Table		Ent Air		Airflow		Corrected
Corrected Total Cooling	= 23,500	x	0.964	x	0.987	=	22,360
Corrected Sensible Cooling	= 17,800	x	1.076	x	0.949	=	18,176
Corrected Heat of Rejection	= 30,300	x	0.971	x	0.985	=	28,980

Compare the corrected capacities to the load requirements established in Step I. If the capacities are within 10% of the load requirements, the equipment is acceptable. It is better to undersize than oversize as undersizing improves humidity control, reduces sound levels and extends the life of the equipment.

VI Water temperature rise calculation and assessment.

Calculate the water temperature rise and assess the selection using the following calculation:

$$\text{Actual Temperature Rise} = \frac{\text{Correction of Heat Rejection}}{\text{GPM x 500}}$$

For example, using the Corrected Heat of Rejection from the last step:

$$\text{Actual Temperature Rise} = \frac{28{,}980}{4.5 \text{ x } 500} = 12.9 \text{ F}$$

If the units selected are not within 10% of the load calculations, review what effect changing the GPM, water temperature and/or airflow will have on the corrected capacities. If the desired capacity cannot be achieved, select the next larger or smaller unit and repeat Steps I through VI.

VII ARI/ISO/ASHRAE 13256-1 Conversion

Performance standard ARI/ISO/ASHRAE 13256-1 became effective on January 1, 2000 and replaced the existing ARI Standards 320 Water-Loop Heat Pumps (WLHP), 325 Ground-Water Heat Pumps (GWHP), and 330 Ground-Loop Heat Pumps (GLHP).

The ARI/ISO Standard incorporates a consistent rating methodology for including fan and pump energy for calculating cooling capacity, heating capacity, and energy efficiency ratios (EER). This simplifies the use of rating data for heat pump performance modeling in seasonal energy analysis calculations, and allows for direct rating comparisons across applications.

a) ISO Capacity and Efficiency Equations

The following equations are used to calculate and correct cooling capacity, heating capacity, and respective EER:

ISO Cooling Capacity = (Cooling Capacity in Btuh) + (Fan Power Correction in Watts x 3.412)

ISO Cooling EER = (ISO Cooling Capacity in Btuh/3.412)/(Power Input in watts – fan power correction in watts + pump power correction in watts) = Watts/Watts

NOTE: Do not divide ISO Cooling Capacity by 3.412 to obtain Btuh/Watts.

ISO Heating Capacity = (Heating Capacity in Btuh) – (Fan Power Correction in Watts x 3.412)

ISO Heating EER = (ISO Heating Capacity in Btuh/3.412)/(Power Input in watts – fan power correction in watts + pump power correction in watts) = Watts/Watts

NOTE: Do not divide ISO Heating Capacity by 3.412 to obtain Btuh/Watts.

Refer to English to SI conversion table in this book.

b) Identify the design conditions corrected for air and water conditions.

Airflow Cfm = 700 Cfm

Water Flow
(Based upon 12 F rise in temp) = 4.5 GPM

External Static Pressure = 0.4 in. wg

Water Pressure Drop = 8.1 ft of head

Power input = 2,010 watts

Cooling Capacity = 22,360 Btuh

c) Perform Fan Power Correction Adjustment

Use the following formula to calculate Fan Power Correction:

Fan Power Correction = (Cfm x 0.472) x (External Static Pressure x 249)/300 = Watts
= (700 x 0.472) x (0.4 x 249)/300
= 110 Watts

d) Perform Pump Power Correction Adjustment

Use the following formula to calculate Pump Power Correction:

Pump Power Correction = (GPM x 0.0631) x (Pressure Drop x 2,990)/300
= Watts
= (4.5 x 0.0631) x (8.1 x 2,990)/300
= 23 Watts

e) Perform capacity and EER calculations

Use the following formula to calculate capacity and EER:

ISO Cooling Capacity = (Cooling Capacity) + (Fan Power Correction x 3.412)
= 22,360 + (110 x 3.412)
= 22,735 Btuh

f) Perform Corrections by using the ISO Equations

ISO EER = (ISO Cooling Capacity/3.412)/(Power Input – Fan Power Correction + Pump Power Correction)
= Watts/Watts

NOTE: Do not divide ISO Cooling Capacity by 3.412 to obtain Btuh/Watts.

= (22,735/3.412)/(2,010 – 110 + 23)
= 3.47 Watts/Watt
= 11.82 Btuh/Watt

Performance data

50RHC,RVC018 — 600 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING				HEATING		
		PSI	Ft Wg	TC	TSC	kW	THR	TC	kW	THA
60	2.3	2.1	4.8	20.2	14.8	1.37	24.8	19.9	1.54	14.6
	3.4	3.0	7.0	20.9	15.1	1.28	25.3	20.7	1.57	15.4
	4.5	4.3	9.8	21.3	15.2	1.24	25.6	21.1	1.58	15.7
70*	2.3	2.0	4.6	19.3	14.4	1.48	24.4	21.6	1.60	16.1
	3.4	2.9	6.7	20.0	14.7	1.39	24.7	22.4	1.63	16.8
	4.5	**4.1**	**9.5**	20.3	14.9	1.36	24.9	**22.7**	**1.64**	**17.1**
80	2.3	1.9	4.5	18.3	13.8	1.58	23.7	23.1	1.65	17.4
	3.4	2.8	6.5	19.1	14.3	1.50	24.2	23.8	1.68	18.1
	4.5	4.0	9.2	19.4	14.4	1.47	24.4	24.1	1.69	18.3
85*	2.3	1.9	4.4	17.6	13.4	1.63	23.1	23.7	1.68	18.0
	3.4	2.8	6.4	18.6	14.0	1.56	23.9	24.4	1.71	18.6
	4.5	**3.9**	**9.1**	**18.9**	**14.2**	**1.52**	**24.1**	24.7	1.72	18.8
90	2.3	1.9	4.4	16.7	12.9	1.67	22.4	24.3	1.70	18.5
	3.4	2.7	6.3	17.9	13.6	1.61	23.4	24.9	1.73	19.0
	4.5	3.9	9.0	18.3	13.8	1.58	23.7	25.3	1.74	19.4
95	2.3	1.9	4.3	15.7	12.3	1.72	21.5	Operation Not Recommended		
	3.4	2.7	6.3	17.1	13.1	1.65	22.7			
	4.5	3.8	8.9	17.6	13.4	1.63	23.2			

LEGEND

DB — Dry Bulb
EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)
WB — Wet Bulb

*ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. See Performance Correction tables for operating conditions other than those listed above.
5. Data table does not reflect ISO pump or fan corrections.
6. Performance capacities shown in thousands of Btuh.

50RHC,RVC024 — 800 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING				HEATING		
		PSI	Ft Wg	TC	TSC	kW	THR	TC	kW	THA
60	3.0	2.0	4.6	25.5	19.1	1.71	31.3	26.3	1.74	20.3
	4.5	3.8	8.9	25.8	19.2	1.62	31.4	27.4	1.78	21.4
	6.0	6.4	14.9	26.0	19.3	1.58	31.4	28.0	1.80	21.9
70*	3.0	1.9	4.4	24.9	18.7	1.85	31.2	28.6	1.83	22.4
	4.5	3.7	8.5	25.3	19.0	1.76	31.3	29.7	1.87	23.3
	6.0	**6.2**	**14.3**	25.5	19.1	1.71	31.3	**30.1**	**1.89**	**23.7**
80	3.0	1.9	4.3	23.9	18.0	1.97	30.6	30.5	1.90	24.0
	4.5	3.6	8.3	24.6	18.5	1.89	31.0	31.3	1.94	24.7
	6.0	6.0	13.9	24.9	18.7	1.84	31.2	31.6	1.95	25.0
85*	3.0	1.8	4.2	23.2	17.6	2.03	30.2	31.2	1.93	24.6
	4.5	3.6	8.2	24.1	18.2	1.95	30.8	31.9	1.97	25.1
	6.0	**6.0**	**13.8**	**24.5**	**18.4**	**1.91**	**31.0**	32.1	1.98	25.3
90	3.0	1.8	4.2	22.4	17.2	2.08	29.5	31.8	1.96	25.1
	4.5	3.5	8.1	23.5	17.8	2.01	30.3	32.3	1.99	25.5
	6.0	5.9	13.6	23.9	18.1	1.97	30.6	32.4	2.00	25.6
95	3.0	1.8	4.1	21.5	16.6	2.13	28.7	Operation Not Recommended		
	4.5	3.5	8.0	22.7	17.3	2.07	29.8			
	6.0	5.8	13.4	23.2	17.6	2.03	30.2			

LEGEND

DB — Dry Bulb
EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)
WB — Wet Bulb

*ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. See Performance Correction tables for operating conditions other than those listed above.
5. Data table does not reflect ISO pump or fan corrections.
6. Performance capacities shown in thousands of Btuh.

Performance data (cont)

50RHC,RVC030 — 1000 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING				HEATING		
		PSI	Ft Wg	TC	TSC	kW	THR	TC	kW	THA
60	3.8	1.6	3.6	28.8	21.3	2.00	35.7	31.2	2.22	23.6
	5.6	2.8	6.5	29.2	21.5	1.91	35.7	32.1	2.24	24.5
	7.5	4.4	10.1	29.4	21.7	1.87	35.7	32.6	2.25	24.9
70*	3.8	1.5	3.5	28.1	21.0	2.17	35.5	33.3	2.26	25.5
	5.6	2.7	6.2	28.7	21.2	2.06	35.7	34.1	2.28	26.3
	7.5	**4.2**	**9.7**	28.9	21.3	2.01	35.7	**34.6**	**2.29**	**26.7**
80	3.8	1.5	3.4	26.9	20.4	2.34	34.9	35.0	2.30	27.2
	5.6	2.6	6.1	27.7	20.8	2.23	35.4	35.8	2.33	27.9
	7.5	4.1	9.4	28.1	20.9	2.18	35.5	36.2	2.34	28.2
85*	3.8	1.4	3.3	26.2	20.1	2.43	34.5	35.8	2.33	27.9
	5.6	2.6	6.0	27.1	20.5	2.32	35.0	36.6	2.36	28.5
	7.5	**4.0**	**9.3**	**27.5**	**20.7**	**2.27**	**35.3**	36.9	2.37	28.8
90	3.8	1.4	3.3	25.4	19.7	2.50	33.9	36.6	2.36	28.5
	5.6	2.6	5.9	26.4	20.1	2.41	34.6	37.2	2.38	29.1
	7.5	4.0	9.2	26.8	20.4	2.35	34.9	37.5	2.40	29.3
95	3.8	1.4	3.2	24.5	19.2	2.57	33.3	Operation Not Recommended		
	5.6	2.5	5.8	25.6	19.7	2.49	34.1			
	7.5	3.9	9.1	26.1	20.0	2.44	34.4			

LEGEND

DB — Dry Bulb
EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)
WB — Wet Bulb

*ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. See Performance Correction tables for operating conditions other than those listed above.
5. Data table does not reflect ISO pump or fan corrections.
6. Performance capacities shown in thousands of Btuh.

50RHC,RVC036 — 1200 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING				HEATING		
		PSI	Ft Wg	TC	TSC	kW	THR	TC	kW	THA
60	4.5	1.8	4.1	38.2	26.8	2.74	47.6	39.0	2.94	28.9
	6.8	3.2	7.4	39.0	26.9	2.58	47.8	41.4	3.03	31.0
	9.0	5.1	11.8	39.3	27.1	2.50	47.8	42.6	3.07	32.1
70*	4.5	1.7	3.9	36.6	26.3	2.95	46.6	43.9	3.12	33.3
	6.8	3.1	7.2	37.8	26.7	2.80	47.3	46.2	3.21	35.2
	9.0	**4.9**	**11.3**	38.3	26.8	2.72	47.6	**47.2**	**3.25**	**36.1**
80	4.5	1.7	3.8	34.4	25.6	3.15	45.1	47.9	3.28	36.7
	6.8	3.0	7.0	35.9	26.2	3.01	46.2	49.7	3.36	38.2
	9.0	4.8	11.0	36.7	26.4	2.94	46.7	50.5	3.40	38.9
85*	4.5	1.6	3.8	33.1	25.0	3.24	44.1	49.5	3.35	38.1
	6.8	3.0	6.9	34.8	25.8	3.11	45.4	50.9	3.42	39.3
	9.0	**4.7**	**10.9**	**35.6**	**26.0**	**3.05**	**46.0**	51.5	3.45	39.7
90	4.5	1.6	3.7	31.6	24.3	3.34	43.0	50.8	3.41	39.1
	6.8	2.9	6.8	33.5	25.2	3.21	44.5	51.8	3.47	39.9
	9.0	4.6	10.7	34.4	25.6	3.15	45.1	52.1	3.50	40.2
95	4.5	1.6	3.7	30.1	23.5	3.43	41.8	Operation Not Recommended		
	6.8	2.9	6.7	32.0	24.6	3.31	43.3			
	9.0	4.6	10.6	33.0	25.0	3.25	44.1			

LEGEND

DB — Dry Bulb
EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)
WB — Wet Bulb

*ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. See Performance Correction tables for operating conditions other than those listed above.
5. Data table does not reflect ISO pump or fan corrections.
6. Performance capacities shown in thousands of Btuh.

Performance data (cont)

50RVC041 — 1325 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING				HEATING		
		PSI	Ft Wg	TC	TSC	kW	THR	TC	kW	THA
60	5.3	1.0	2.2	40.0	29.0	2.78	49.4	43.1	3.21	32.2
	7.9	2.2	5.1	40.5	29.0	2.67	49.6	44.7	3.28	33.5
	10.5	4.0	9.3	40.9	29.0	2.62	49.8	45.5	3.32	34.1
70*	5.3	0.9	2.1	39.1	29.0	3.00	49.4	46.6	3.37	35.1
	7.9	2.1	5.0	39.7	29.0	2.86	49.4	48.1	3.43	36.3
	10.5	**3.9**	**8.9**	39.9	29.0	2.79	49.4	**48.8**	**3.46**	**36.9**
80	5.3	0.9	2.1	37.9	28.4	3.24	49.0	49.6	3.50	37.6
	7.9	2.1	4.8	38.8	28.9	3.09	49.3	50.8	3.56	38.7
	10.5	3.8	8.7	39.1	29.0	3.01	49.4	51.4	3.58	39.2
85*	5.3	0.9	2.0	37.0	27.8	3.36	48.5	50.9	3.56	38.7
	7.9	2.1	4.8	38.1	28.5	3.21	49.1	52.0	3.61	39.7
	10.5	**3.7**	**8.6**	**38.5**	**28.8**	**3.13**	**49.2**	52.6	3.64	40.1
90	5.3	0.9	2.0	35.9	27.1	3.48	47.7	52.0	3.61	39.7
	7.9	2.0	4.7	37.3	27.9	3.33	48.6	53.0	3.66	40.5
	10.5	3.7	8.5	37.8	28.3	3.26	48.9	53.5	3.68	40.9
95	5.3	0.9	2.0	34.4	26.3	3.58	46.7	Operation Not Recommended		
	7.9	2.0	4.6	36.2	27.3	3.45	47.9			
	10.5	3.6	8.4	36.9	27.7	3.38	48.4			

LEGEND

DB — Dry Bulb
EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)
WB — Wet Bulb

*ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. See Performance Correction tables for operating conditions other than those listed above.
5. Data table does not reflect ISO pump or fan corrections.
6. Performance capacities shown in thousands of Btuh.

50RHC,RVC042 — 1350 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING				HEATING		
		PSI	Ft Wg	TC	TSC	kW	THR	TC	kW	THA
60	5.3	1.0	2.4	43.2	31.0	3.03	53.5	46.8	3.47	34.9
	8.0	2.7	6.2	43.8	31.0	2.89	53.6	48.9	3.58	36.7
	11.0	5.5	12.7	44.2	31.0	2.84	53.9	50.0	3.63	37.6
70*	5.3	1.0	2.3	42.3	30.8	3.29	53.5	51.2	3.69	38.7
	8.0	2.6	6.0	42.9	30.9	3.11	53.5	53.3	3.79	40.4
	11.0	**5.3**	**12.2**	43.2	31.0	3.02	53.5	**54.4**	**3.83**	**41.3**
80	5.3	1.0	2.2	40.8	30.2	3.58	53.0	55.1	3.87	42.0
	8.0	2.5	5.8	41.9	30.7	3.38	53.4	57.0	3.95	43.6
	11.0	5.2	11.9	42.3	30.8	3.28	53.5	58.0	3.98	44.4
85*	5.3	1.0	2.2	39.6	29.7	3.72	52.3	56.9	3.94	43.4
	8.0	2.5	5.8	41.1	30.4	3.53	53.1	58.6	4.01	45.0
	11.0	**5.1**	**11.8**	**41.6**	**30.6**	**3.43**	**53.3**	59.5	4.04	45.7
90	5.3	0.9	2.2	38.2	29.0	3.85	51.3	58.4	4.00	44.8
	8.0	2.5	5.7	40.0	29.9	3.67	52.6	60.1	4.06	46.2
	11.0	5.0	11.6	40.8	30.2	3.58	53.0	60.8	4.08	46.9
95	5.3	0.9	2.2	36.4	28.0	3.96	49.9	Operation Not Recommended		
	8.0	2.4	5.6	38.7	29.2	3.81	51.7			
	11.0	5.0	11.5	39.6	29.7	3.72	52.3			

LEGEND

DB — Dry Bulb
EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)
WB — Wet Bulb

*ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. See Performance Correction tables for operating conditions other than those listed above.
5. Data table does not reflect ISO pump or fan corrections.
6. Performance capacities shown in thousands of Btuh.

Performance data (cont)

50RHC,RVC048 — 1600 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING				HEATING		
		PSI	Ft Wg	TC	TSC	kW	THR	TC	kW	THA
60	6.0	1.2	2.9	50.2	35.8	3.67	62.7	52.1	3.70	39.5
	9.0	2.9	6.7	50.9	36.1	3.48	62.8	54.6	3.79	41.7
	12.0	5.3	12.3	51.2	36.3	3.39	62.8	56.0	3.84	42.9
70*	6.0	1.2	2.8	48.8	35.4	3.96	62.3	57.4	3.89	44.1
	9.0	2.8	6.5	49.8	35.6	3.76	62.6	59.9	3.98	46.3
	12.0	**5.1**	**11.8**	50.2	35.8	3.66	62.7	**61.1**	**4.02**	**47.4**
80	6.0	1.2	2.7	46.6	34.8	4.25	61.1	62.0	4.05	48.2
	9.0	2.7	6.3	48.2	35.3	4.05	62.0	64.2	4.13	50.1
	12.0	5.0	11.5	48.8	35.4	3.95	62.3	65.2	4.16	51.0
85*	6.0	1.2	2.7	45.2	34.3	4.38	60.2	64.0	4.12	49.9
	9.0	2.7	6.2	47.1	34.9	4.20	61.4	66.0	4.18	51.7
	12.0	**4.9**	**11.3**	**47.9**	**35.2**	**4.10**	**61.8**	66.9	4.21	52.6
90	6.0	1.1	2.6	43.5	33.5	4.51	58.9	65.7	4.18	51.5
	9.0	2.7	6.1	45.7	34.5	4.34	60.5	67.6	4.23	53.1
	12.0	4.8	11.2	46.7	34.8	4.24	61.1	68.4	4.25	53.9
95	6.0	1.1	2.6	41.6	32.6	4.62	57.4	Operation Not Recommended		
	9.0	2.6	6.1	44.1	33.8	4.47	59.3			
	12.0	4.8	11.0	45.2	34.3	4.38	60.2			

LEGEND

DB — Dry Bulb
EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)
WB — Wet Bulb

*ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. See Performance Correction tables for operating conditions other than those listed above.
5. Data table does not reflect ISO pump or fan corrections.
6. Performance capacities shown in thousands of Btuh.

50RHC,RVC060 — 2000 CFM NOMINAL AIRFLOW

EWT (F)	GPM	PRESSURE DROP		COOLING				HEATING		
		PSI	Ft Wg	TC	TSC	kW	THR	TC	kW	THA
60	7.5	4.4	10.1	60.5	43.1	4.36	75.4	63.0	5.02	45.9
	11.3	7.6	17.5	61.2	43.2	4.17	75.5	67.4	5.17	49.8
	15.0	11.5	26.7	61.6	43.3	4.08	75.5	69.8	5.25	51.9
70*	7.5	4.2	9.7	59.0	42.9	4.68	74.9	72.6	5.34	54.4
	11.3	7.3	16.9	60.1	43.1	4.46	75.3	77.0	5.49	58.2
	15.0	**11.1**	**25.6**	60.5	43.2	4.36	75.4	**79.2**	**5.56**	**60.2**
80	7.5	4.1	9.4	56.8	42.4	5.04	74.0	80.6	5.61	61.5
	11.3	7.1	16.4	58.3	42.8	4.80	74.7	84.4	5.74	64.8
	15.0	10.8	25.0	59.0	42.9	4.68	74.9	86.2	5.80	66.4
85*	7.5	4.0	9.3	55.4	42.0	5.23	73.3	83.9	5.73	64.4
	11.3	7.0	16.2	57.2	42.5	4.98	74.1	87.3	5.84	67.4
	15.0	**10.7**	**24.6**	**57.9**	**42.7**	**4.86**	**74.5**	88.7	5.89	68.7
90	7.5	4.0	9.2	53.9	41.4	5.44	72.4	86.8	5.82	66.9
	11.3	6.9	16.0	55.8	42.1	5.17	73.5	89.5	5.91	69.4
	15.0	10.5	24.3	56.7	42.4	5.04	73.9	90.6	5.95	70.3
95	7.5	3.9	9.1	52.1	40.5	5.66	71.4	Operation Not Recommended		
	11.3	6.8	15.8	54.3	41.6	5.38	72.7			
	15.0	10.4	24.0	55.3	42.0	5.24	73.2			

LEGEND

DB — Dry Bulb
EWT — Entering Water Temperature (F)
GPM — Gallons Per Minute
TC — Total Capacity (MBtuh)
THA — Total Heat of Absorption (MBtuh)
THR — Total Heat of Rejection (MBtuh)
TSC — Total Sensible Capacity (MBtuh)
WB — Wet Bulb

*ARI 320 points (bold printing) are shown for comparison purposes only. These are not certified data points.

NOTES:
1. Interpolation is permissible, extrapolation is not.
2. All entering air conditions are 80 F db (dry bulb) and 67 F wb (wet bulb) in cooling and 70 F db in heating.
3. All performance data is based upon the lower voltage of dual voltage rated units.
4. See Performance Correction tables for operating conditions other than those listed above.
5. Data table does not reflect ISO pump or fan corrections.
6. Performance capacities shown in thousands of Btuh.

Performance data (cont)

AIRFLOW CORRECTION TABLE

AIRFLOW		HEATING			COOLING			
CFM Per Ton of Clg	% of Nominal	Htg Cap	Power	Heat of Ext	Total Cap	Sens Cap	kW	THR
300	75%	0.966	1.051	0.939	0.970	0.899	0.953	0.967
325	81%	0.976	1.037	0.956	0.979	0.924	0.966	0.976
350	88%	0.985	1.023	0.973	0.987	0.949	0.979	0.985
375	94%	0.993	1.012	0.987	0.994	0.975	0.990	0.993
400	**100%**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
425	106%	1.006	0.991	1.010	1.005	1.026	1.008	1.005
450	113%	1.011	0.982	1.020	1.009	1.051	1.016	1.010
475	119%	1.014	0.975	1.027	1.011	1.077	1.022	1.013
500	125%	1.017	0.968	1.033	1.013	1.102	1.027	1.016

LEGEND

Clg — Cooling
Htg — Heating
THR — Total Heat of Rejection (MBtuh)

NOTE: 400 cfm is nominal airflow.

ENTERING AIR CORRECTION TABLE

HEATING CORRECTIONS				COOLING CORRECTIONS									
Ent Air DB (F)	Heating Capacity	Power	Heat of Ext	Ent Air WB (F)	Total Clg Cap	Sens Clg Cap Multiplier - Entering DB (F)							kW	THR
						70	75	80	80.6	85	90	95		
45	1.044	0.803	1.123	**60**	0.858	0.812	1.062	1.217	1.229	*	*	*	0.982	0.886
50	1.042	0.847	1.107	**65**	0.964	0.622	0.876	1.076	1.098	1.240	*	*	0.996	0.971
55	1.037	0.888	1.086	**66.2**	0.986	0.577	0.822	1.032	1.055	1.214	*	*	0.999	0.989
60	1.028	0.927	1.062	**67**	1.000	0.547	0.785	1.000	1.024	1.192	1.362	1.508	1.000	1.000
65	1.016	0.965	1.033	**70**	1.049	—	0.630	0.864	0.891	1.086	1.236	1.399	1.004	1.039
68	1.007	0.986	1.014	**75**	1.113	—	—	0.580	0.609	0.814	1.027	1.218	1.007	1.089
70	1.000	1.000	1.000											
75	0.980	1.033	0.963											
80	0.957	1.065	0.921											

LEGEND

Clg — Cooling
DB — Dry Bulb
Htg — Heating
THR — Total Heat of Rejection
WB — Wet Bulb

*Sensible capacity equals total capacity.

NOTES:
1. ARI/ISO/ASHRAE 13256-1 uses entering air conditions of Cooling — 80.6° F db/66.2° F wb and Heating — 68° F db/59° F wb.
2. Discontinued Standards ARI 320, 325, and 330 used entering air conditions of Cooling 80° F db/67° F wb and Heating — 70° F db (bold print).

CONVERSION TABLE – ENGLISH TO SI

MEASUREMENT	CONVERSION
Airflow	Airflow (lps) = CFM x 0.472
Water Flow	Water flow (lps) = Gpm x 0.0631
External Static Pressure	ESP (Pascal) = ESP (in. wg) x 249
Water Pressure Drop	PD (Pascal) = PD (ft of head) x 2,990

LEGEND

ESP — External Static Pressure
PD — Pressure Drop

50RHC,RVC BLOWER PERFORMANCE

50RHC,RVC	RATED CFM	MIN CFM	FAN SPEED	EXTERNAL STATIC PRESSURE (in. wg)																	
				0.00	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.60	0.70	0.80	0.90	1.0	1.10	1.20	1.30
018	600	450	HI			760	740	720	710	700	680	650	600	550	460							
			MED	700	690	680	670	660	650	630	620	600	560	520	430							
			LO	620	610	600	590	580	570	560	540	520	490	460								
018 High Static	600	450	HI				790	780	770	760	750	730	710	690	650	530	430					
			MED	750	740	720	710	700	690	670	670	660	650	630	600	490	390					
			LO	670	660	640	630	620	610	600	590	580	580	570	530	420						
024	800	600	HI									1000	970	930	870	770	690					
			MED	1010	1000	990	980	960	940	920	900	880	860	830	770	700	600					
			LO	820	810	800	790	780	770	760	750	730	720	700	650	600						
024 High Static	800	600	HI											1030	950	840	700					
			MED									1040	1010	970	890	750	620					
			LO					1030	1010	980	960	930	900	870	790	710						
030	1000	750	HI							1160	1130	1100	1070	1030	950	840						
			MED	1250	1230	1200	1180	1150	1120	1090	1070	1040	1010	970	890	750						
			LO	1120	1100	1070	1050	1030	1010	980	960	930	900	870	790	710						
030 High Static	1000	750	HI											1160	1040	920	800	750				
			MED									1130	1080	1030	930	820	750					
			LO	1050	1040	1030	1010	990	980	960	940	910	880	840	750							
036	1200	900	HI	1520	1500	1480	1460	1430	1400	1370	1350	1320	1270	1210	1110	960	840					
			MED	1150	1150	1140	1140	1130	1130	1120	1110	1100	1070	1040	940							
			LO	1010	1010	1000	1000	990	990	980	980	970	950	930								
036 High Static	1200	900	HI									1530	1500	1470	1400	1290	1170	960				
			MED	1360	1350	1340	1330	1320	1310	1300	1280	1260	1250	1230	1150	1070	910					
			LO	1030	1020	1010	1010	1000	1000	990	980	960	950	930								
041	1325	950	HI	1380	1370	1350	1330	1300	1260	1220	1170	1120	1080	1040	890							
			MED	1230	1220	1200	1190	1180	1150	1120	1080	1030	990	950								
			LO	1040	1030	1010	1000	990	970	950												
042	1350	1050	HI	1640	1610	1580	1550	1520	1490	1450	1410	1370	1330	1290	1190	1100						
			MED	1490	1470	1440	1420	1390	1370	1340	1310	1270	1230	1190	1120	1010						
			LO	1140	1140	1130	1130	1120	1110	1100	1080	1060	1010									
042 High Static	1350	1050	HI					1550	1540	1520	1500	1470	1460	1450	1380	1240	1080					
			MED	1390	1380	1370	1360	1350	1340	1320	1310	1300	1280	1250	1180	1080						
			LO																			
048	1600	1200	HI					1980	1950	1910	1860	1800	1740	1680	1490	1280	1280					
			MED	1940	1920	1900	1880	1860	1820	1770	1740	1710	1660	1600	1410	1000						
			LO	1770	1750	1730	1710	1690	1670	1650	1610	1570	1510	1450	1330							
048 High Static	1600	1200	HI									2060	2040	2010	1960	1880	1790	1660	1510			
			MED	2050	2050	2040	2020	1990	1970	1940	1920	1890	1860	1830	1780	1710	1620	1490	1320			
			LO	1850	1850	1840	1830	1810	1800	1780	1760	1730	1700	1670	1600	1510	1380	1220				
060	2000	1500	HI	2240	2240	2230	2220	2200	2160	2120	2090	2060	2040	2010	1960	1880	1790	1660	1510			
			MED	2050	2050	2040	2020	1990	1970	1940	1920	1890	1860	1830	1780	1710	1620	1490				
			LO	1850	1850	1840	1830	1810	1800	1780	1760	1730	1700	1670	1600	1510						
060 High Static	2000	1500	HI	2400	2400	2390	2380	2370	2360	2340	2320	2300	2270	2240	2200	2130	2060	1980	1890	1790	1660	1500
			MED	2160	2160	2150	2150	2140	2110	2080	2060	2040	2030	2020	1980	1930	1880	1490	1750	1660	1530	
			LO	1930	1930	1920	1920	1910	1900	1890	1890	1880	1870	1850	1830	1800	1750	1700	1620	1530		

NOTES:
1. Gray areas denote ESP (external static pressure) where operation is not recommended.
2. Units factory shipped on medium speed. Other speeds require field selection.
3. All airflow is rated at lowest voltage if unit is dual voltage rated, i.e., 208 v for 208-230 v units.
4. All units ARI/ISO/ASHRAE 13256-1 rated on high fan speed.
5. Only two speed fan (H & M) available on 575-v units.
6. For wet coil performance first calculate the face velocity of the air coil (Face Velocity [fpm] = Airflow [cfm]/Face Area [sq ft]). Then for velocities of 200 fpm reduce the static capability by 0.03 in. wg, 300 fpm by 0.08 in. wg, 400 fpm by 0.12 in. wg, and 500 fpm by 0.16 in. wg.
7. Airflow in cfm with dry coil and clean air filter.

Electrical data

50RHC,RVC ELECTRICAL DATA

50RHC,RVC	VOLTS-PHASE 60 Hz	VOLTAGE MIN/MAX	COMPRESSOR		FAN MOTOR FLA	TOTAL UNIT FLA	MIN CIRCUIT AMP	MAX FUSE/HACR
			RLA	LRA				
018	208/230-1	197/254	8.6	49.0	1.00	9.6	11.7	20
	265-1	239/292	8.1	44.0	0.86	8.9	11.0	15
024	208/230-1	197/254	9.8	56.0	1.50	11.3	13.8	20
	265-1	239/292	9.1	55.0	1.30	10.4	12.7	20
	208/230-3	197/254	6.7	51.0	1.50	8.2	9.9	15
	460-3	414/506	3.5	25.0	0.76	4.2	5.1	15
030	208/230-1	197/254	11.2	61.0	3.00	14.2	16.9	25
	265-1	239/292	10.0	58.0	2.70	12.7	15.2	25
	208/230-3	197/254	6.9	55.0	3.00	9.9	11.7	15
	460-3	414/506	3.6	28.0	1.70	5.3	6.2	15
036	208/230-1	197/254	15.4	82.0	1.80	17.2	21.1	35
	265-1	239/292	14.4	83.0	2.00	16.4	20.0	30
	208/230-3	197/254	9.6	70.0	1.80	11.4	13.8	20
	460-3	414/506	4.9	33.0	1.24	6.1	7.4	15
041	208/230-1	197/254	16.2	96.0	3.00	19.2	23.2	35
	208/230-3	197/254	10.3	75.0	3.00	13.3	15.8	25
	460-3	414/506	4.3	40.0	1.70	6.0	7.1	15
	575-3	518/633	4.3	34.0	1.40	5.7	6.8	15
042	208/230-1	197/254	17.1	105.0	3.00	20.1	24.3	40
	208/230-3	197/254	10.7	85.0	3.00	13.7	16.4	25
	460-3	414/506	5.3	42.0	1.70	7.0	8.3	15
	575-3	518/633	3.7	31.0	1.50	5.2	6.1	15
048	208/230-1	197/254	18.3	102.0	3.40	21.7	26.3	40
	208/230-3	197/254	12.6	91.0	3.40	16.0	19.2	30
	460-3	414/506	5.7	42.0	1.80	7.5	8.9	15
	575-3	518/633	4.7	39.0	1.40	6.1	7.2	15
060	208/230-1	197/254	25.6	170.0	4.30	29.9	36.4	60
	208/230-3	197/254	14.7	124.0	4.30	19.0	22.7	35
	460-3	414/506	7.4	59.6	2.50	9.9	11.8	15
	575-3	518/633	5.9	49.4	1.90	7.8	9.3	15

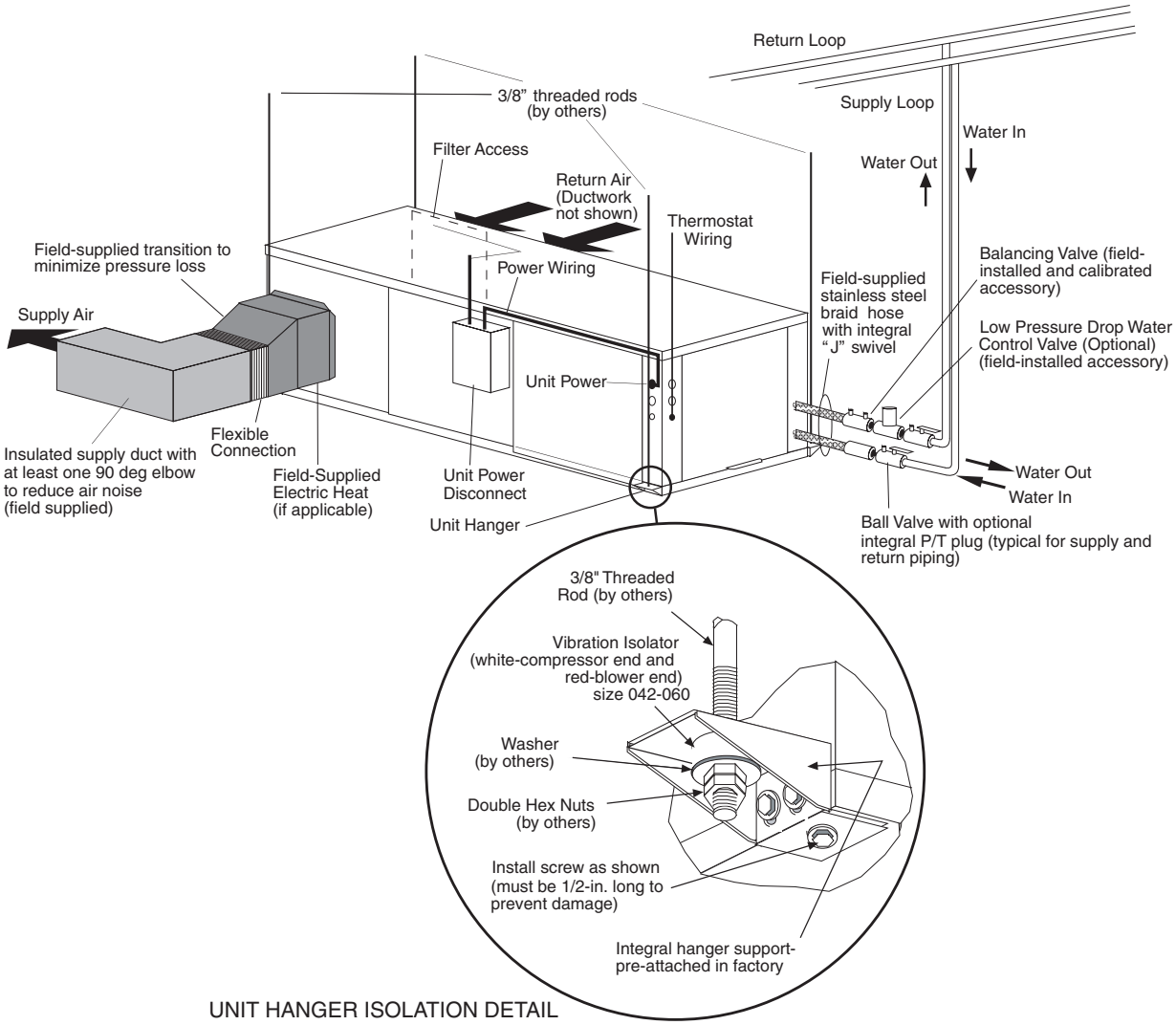
LEGEND

FLA — Full Load Amps
HACR — Heating, Air Conditioning and Refrigeration
LRA — Locked Rotor Amps
RLA — Rated Load Amps

NOTES:
1. HACR circuit breaker in U.S.A. only.
2. All fuses Class RK-5.

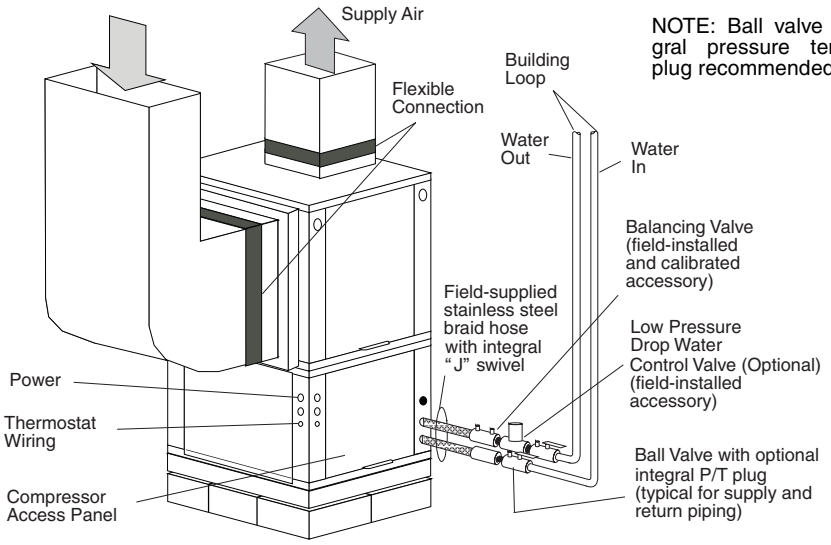
Typical piping and wiring

TYPICAL INSTALLATION — 50RHC UNITS


Return Loop
3/8" threaded rods (by others)
Supply Loop
Water In
Water Out
Filter Access
Return Air (Ductwork not shown)
Thermostat Wiring
Power Wiring
Field-supplied transition to minimize pressure loss
Supply Air
Field-supplied stainless steel braid hose with integral "J" swivel
Balancing Valve (field-installed and calibrated accessory)
Low Pressure Drop Water Control Valve (Optional) (field-installed accessory)
Unit Power
Insulated supply duct with at least one 90 deg elbow to reduce air noise (field supplied)
Flexible Connection
Field-Supplied Electric Heat (if applicable)
Unit Power Disconnect
Unit Hanger
Water Out
Water In
Ball Valve with optional integral P/T plug (typical for supply and return piping)
3/8" Threaded Rod (by others)
Vibration Isolator (white-compressor end and red-blower end) size 042-060
Washer (by others)
Double Hex Nuts (by others)
Install screw as shown (must be 1/2-in. long to prevent damage)
Integral hanger support-pre-attached in factory

UNIT HANGER ISOLATION DETAIL

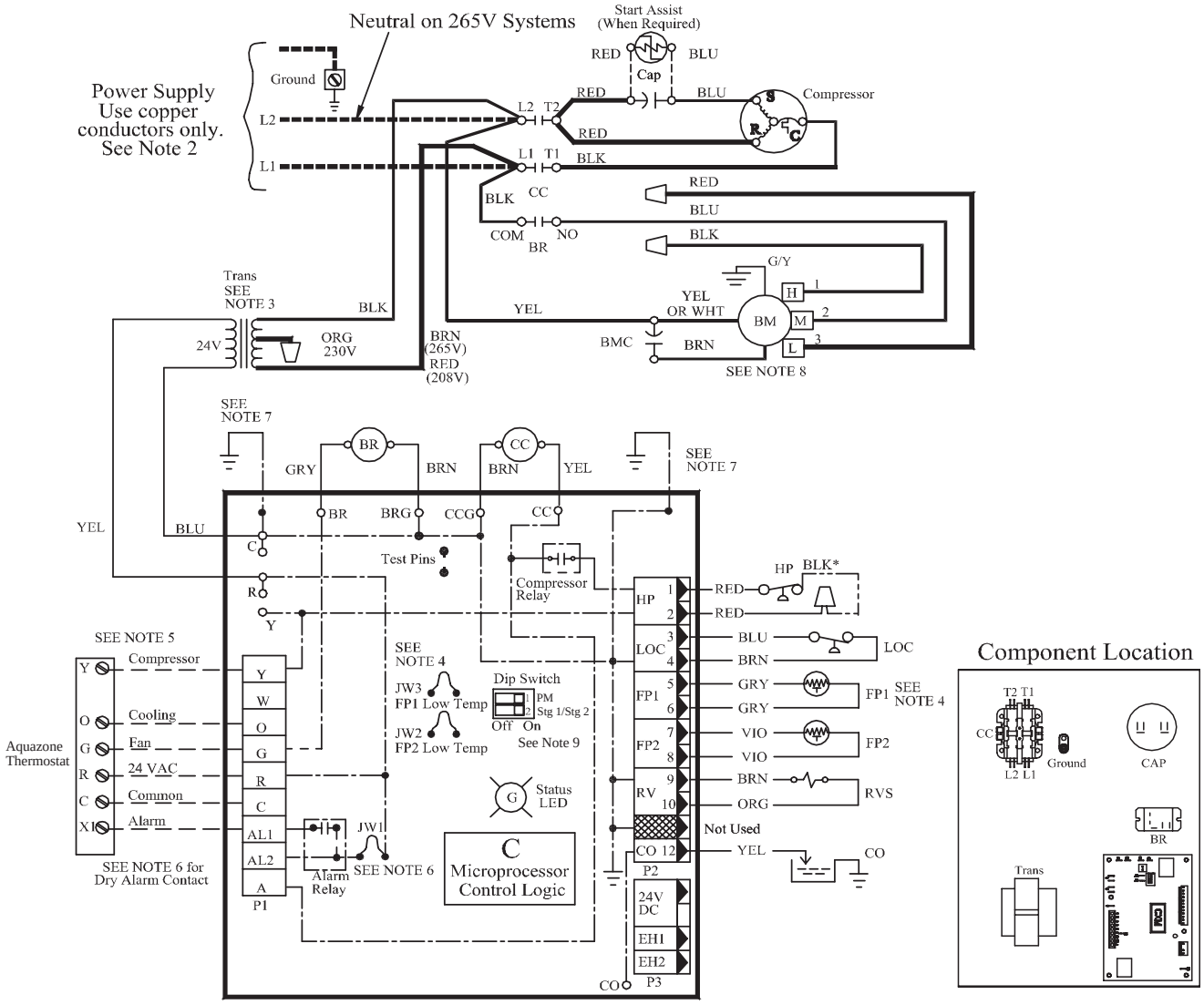
TYPICAL VERTICAL INSTALLATION — 50RVC UNITS


Supply Air
Building Loop
Flexible Connection
Water Out
Water In
Balancing Valve (field-installed and calibrated accessory)
Field-supplied stainless steel braid hose with integral "J" swivel
Low Pressure Drop Water Control Valve (Optional) (field-installed accessory)
Power
Thermostat Wiring
Compressor Access Panel
Ball Valve with optional integral P/T plug (typical for supply and return piping)

NOTE: Ball valve with integral pressure temperature plug recommended.

Typical wiring schematics

TYPICAL AQUAZONE™ COMPLETE C CONTROL WIRING



LEGEND

AL — Alarm Relay Contacts
BM — Blower Motor
BMC — Blower Motor Capacitor
BR — Blower Relay
CAP — Capacitor
CC — Compressor Contactor
CO — Sensor, Condensate Overflow
FP1 — Sensor, Water Coil Freeze Protection
FP2 — Sensor, Air Coil Freeze Protection
HP — High-Pressure Switch
JW1 — Jumper, Alarm

*Optional wiring.

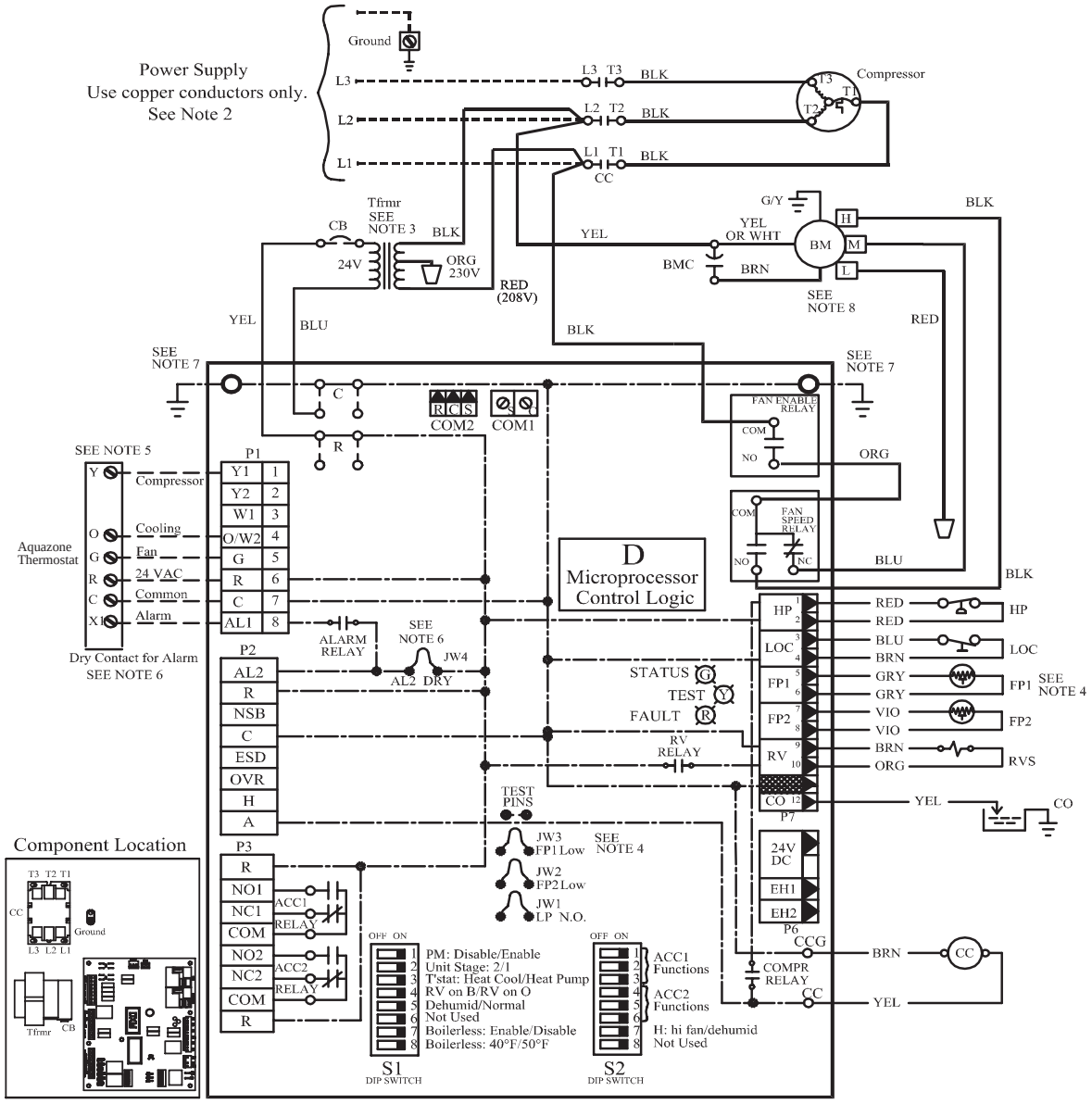
LOC — Loss of Charge Pressure Switch
NEC — National Electrical Code
P1 — Field Wiring Terminal Block
PM — Performance Monitor
RVS — Reversing Valve Solenoid
Trans — Transformer

Field Line Voltage Wiring
Field Low Voltage Wiring
Printed Circuit Trace
Optional Wiring

Relay/Contactor Coil
Condensate Pan
Solenoid Coil
Temperature Switch
Thermistor
Ground
Wire Nut

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer is wired to 265 v (BRN) lead for 265/1/60 units, or 208 v (RED) lead for 208/1/60. For 230/1/60 switch RED and ORG leads at L1 and insulate RED lead. Transformer is energy limiting or may have circuit breaker.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical Aquazone thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
6. 24-v alarm signal shown. For dry alarm contact, cut JW1 jumper and dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via control board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. For high or low speed remove BLU wire from BR 'NO' and replace with BLK or RED wire respectively. Tape off unused terminal.
9. Both DIP switches need to be in the ON position.

TYPICAL AQUAZONE™ DELUXE D CONTROL WIRING



LEGEND

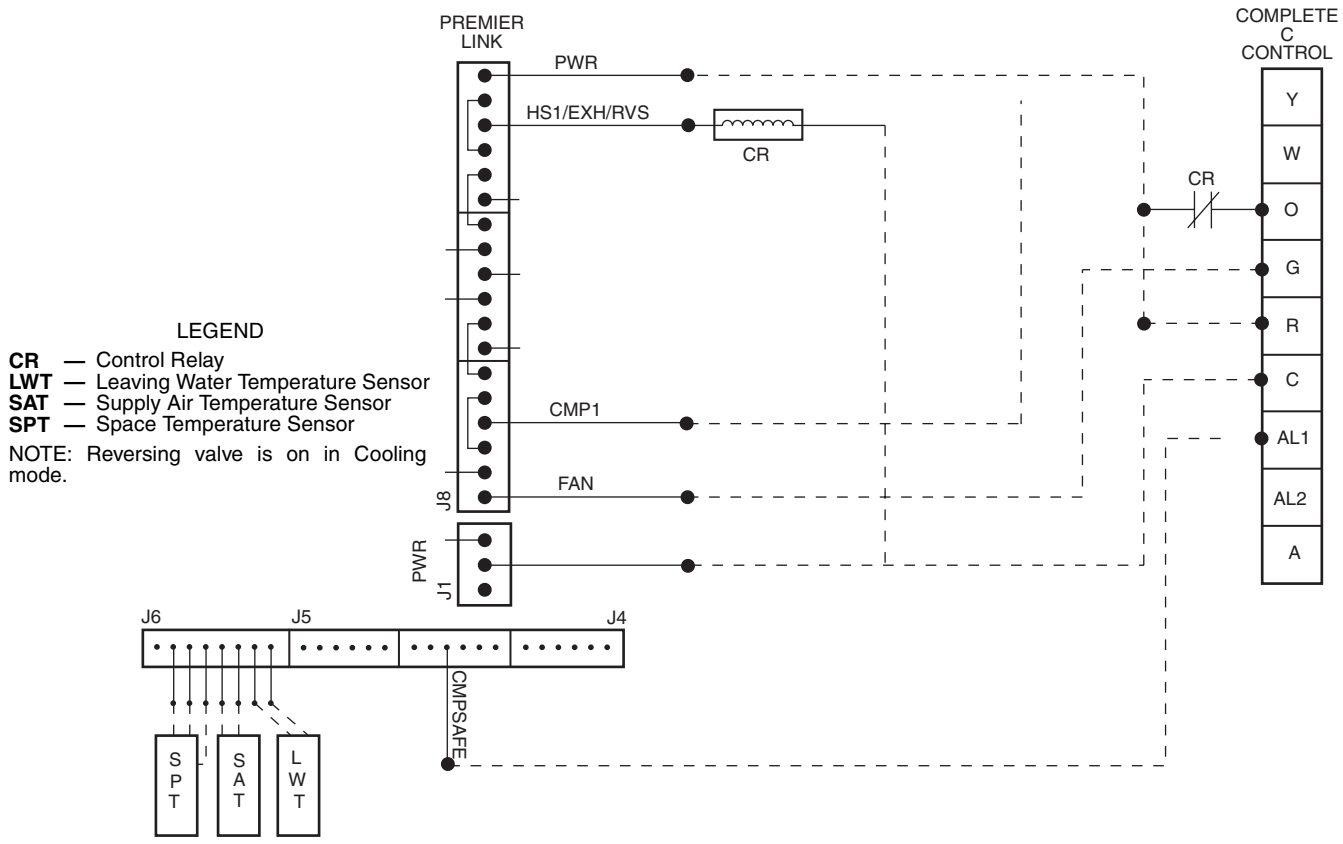
AL — Alarm Relay Contacts
BM — Blower Motor
BMC — Blower Motor Capacitor
CB — Circuit Breaker
CC — Compressor Contactor
CO — Sensor, Condensate Overflow
FP1 — Sensor, Water Coil Freeze Protection
FP2 — Sensor, Air Coil Freeze Protection
HP — High-Pressure Switch
JW1 — Jumper, Alarm
LOC — Loss of Charge Pressure Switch
NEC — National Electrical Code
P1 — Field Wiring Terminal Block
PM — Performance Monitor
RVS — Reversing Valve Solenoid
Tfrmr — Transformer

Field Line Voltage Wiring
Field Low Voltage Wiring
Printed Circuit Trace
Relay/Contactor Coil
Condensate Pan
Solenoid Coil
Thermistor
Ground
Wire Nut

NOTES:
1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer is wired to 208 v (RED) lead for 208/3/60. For 230/3/60 switch RED and ORG leads at L1 and insulate RED lead.
4. FP1 thermistor provides freeze protection for water. When using antifreeze solutions, cut JW3 jumper.
5. Typical Aquazone thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
6. 24-v alarm signal shown. For dry alarm contact, cut AL2 dry jumper and dry contact will be available between AL1 and AL2.
7. Transformer secondary ground via control board standoffs and screws to control box. (Ground available from top two standoffs as shown.)
8. Blower motor is factory wired for medium and high speeds. For any other combination of speeds, attach the lower speed wire to fan speed relay N.O. wire.

Typical control wiring

PREMIERLINK™ CONTROLLER APPLICATIONS WITH COMPLETE C CONTROL

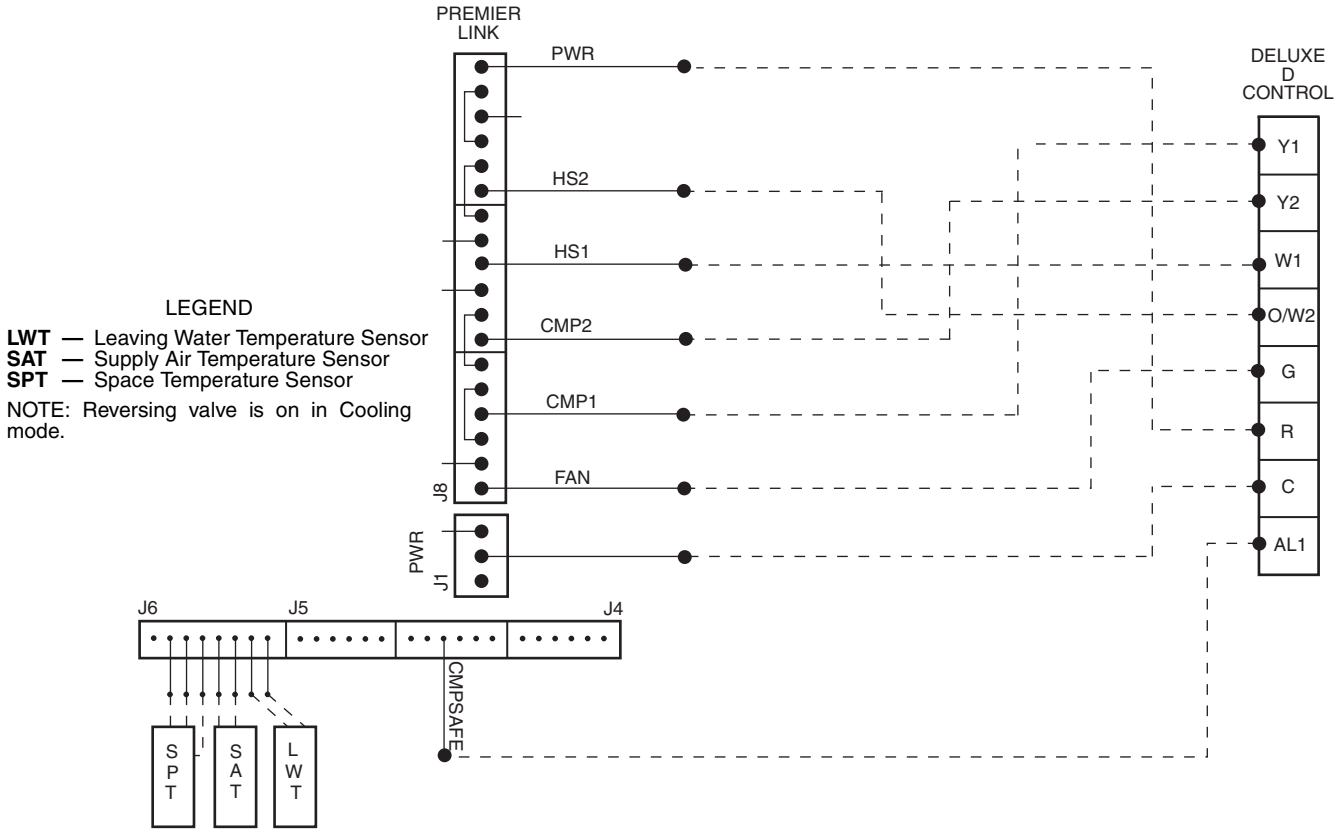


LEGEND

CR — Control Relay
LWT — Leaving Water Temperature Sensor
SAT — Supply Air Temperature Sensor
SPT — Space Temperature Sensor

NOTE: Reversing valve is on in Cooling mode.

PREMIERLINK CONTROLLER APPLICATIONS WITH DELUXE D CONTROL



LEGEND

LWT — Leaving Water Temperature Sensor
SAT — Supply Air Temperature Sensor
SPT — Space Temperature Sensor

NOTE: Reversing valve is on in Cooling mode.

Application data

Aquazone™ water source heat pumps are available in a flexible, efficient array of models, which can be used in all types of water loop, ground water, and ground loop type systems. Aquazone products provide optimal energy efficient solutions and adapt to the most challenging design requirements.

AQUAZONE PRODUCT GUIDE

50 SERIES	TYPE SIZE (tons)	APPLICATION
50RHC,RVC Horizontal/Vertical	Standard Efficiency $1\frac{1}{2}$-5	Efficient, compact, low cost alternative for retrofit or new boiler/tower systems.
50RHR,RVR Horizontal/Vertical	High Efficiency $\frac{1}{2}$-5	Efficient, adaptable unit for new boiler/tower, ground water, or ground loop systems.
50RHS,RVS Horizontal/Vertical	Premium Efficiency $1\frac{1}{4}$-6	Premium, ultra efficient unit for new boiler/tower, ground water, or ground loop systems
50HQ,VQ Horizontal/Vertical	Large Capacity $6\frac{1}{2}$-25	Designed to handle large zoned areas for all applications.
50KQ	Console $\frac{1}{2}$-$1\frac{1}{2}$	Attractive design for finished interior, under-window installations.
50RTG	Rooftop 3-20	Economical solution for IAQ problems and tempering ventilation air.
50RWS	Water-to-Water 3-10	Used to pre-heat or cool air and can be used as a stand-alone or supplemental boiler/chiller in most hydronic heating applications. Also conditions process fluids, lubricants and refrigerants.

Water loop system

Water loop (or boiler/tower) system applications typically include a number of units plumbed to a common piping system. For optimal performance, this system should be designed between 2.25 and 3 gpm per ton of cooling capacity. The system is comprised of highly efficient packaged reverse cycle heat pump units interconnected by a water loop. The water circuit serves as both a sink and source for heat absorption and rejection and is designed for entering water temperatures between 60 F and 90 F. Within this temperature range units can heat or cool as required from the same water source. Transferring heat from warm to cold spaces in the building, whenever they coexist, conserves energy rather than creating new heat.

Refer to the **Carrier Water Source Heat Pump System Design Guide** for assistance designing water loop systems. The guide includes a practical approach for the most current design recommendations including:

- Product application including horizontal, vertical, console, rooftop and water-to-water applications.
- Ventilation methods and system design including energy recovery.
- Acoustical considerations for different product types.
- Addressing IAQ issues such as condensate removal, humidity control.
- Air Distribution Design including diffuser selection/layout and ductwork design.
- Hydronic System Design including pipe sizing/layout and boiler/tower sizing.
- Control Configurations such as stand alone, DDC, DCV, and VVT®.
- WSHP Efficiency/Operational Cost Comparison chart.
- System variations such as a system without a boiler, variable pumping, and VAV for interior use.

Condensate drainage

Venting — Properly vent condensate lines to prevent fan pressure from causing water to hang up in the piping. Condensate lines should be pitched to assure full drainage of condensate under all load conditions. Use chemical treatment to remove algae in the condensate pans and drains in geographical areas that are conducive to algae growth.

Trapping — Condensate trapping is a necessity on every water source heat pump unit. A trap is provided to prevent the backflow of moisture from the condensate pan and into the fan intake or downstream into the mechanical system. The water seal or the length of the trap depends on the positive or negative pressure on the drain pan. As a rule of thumb, size the water seal 1 in. for every 1 in. of negative pressure on the unit. The water seal is the distance from the bottom of the unit condensate piping connection to the bottom of the condensate drain line run-out piping. Therefore, the trap size should be double the water seal dimension.

Horizontal units — Horizontal units should be sloped toward the drain at a $\frac{1}{4}$ in. per foot pitch. If it is not possible to meet the pitch requirement, a condensate pump should be designed and installed at the unit to pump condensate to a building drain. Horizontal units are not internally trapped; therefore an external trap is necessary. Each unit must be installed with its own individual trap and means to flush or blowout the condensate drain. It is not acceptable to use a common trap or vent for multiple units. The condensate piping system should not be designed with a pipe size smaller than the drain connection pipe size.

Vertical units — Vertical units use a condensate hose inside the cabinet that acts as a trapping loop, making an external trap unnecessary. Install each unit with its own vent and means to flush or blowout the condensate drain lines. Do not install a common trap or vent on vertical units.

Water conditioning

In some applications, maintaining proper water quality may require higher corrosion protection for the water-to-refrigerant heat exchanger. Water quality varies from location to location and is unique for each job. Water characteristics such as pH value, alkalinity, hardness, and specific conductance are important when considering any WSHP application. Water typically includes impurities and hardness that must be removed. The required treatment will depend on the water quality as well as type of system. Water problems fall into three main categories:

1. Scale formation caused by hard water reduces the heat transfer rate and increases the water pressure drop through the heat exchanger. As water is heated, minerals and salts are precipitated from a solution and deposited on the inside surface of the pipe or tube.

2. Corrosion is caused by absorption of gases from the air coupled with water on exposed metal. Corrosion is also common in salt-water areas.
3. Organic growths such as algae can reduce the heat transfer rate by forming an insulating coating on the inside tube surface. Algae can also promote corrosion by pitting.

NOTE: In most commercial water loop applications, Aquazone™ WSHP units use copper water-to-refrigerant heat exchanger. Units can also be equipped with a Cupronickel heat exchanger for applications where water is outside the standard contaminant limits for a copper heat exchanger.

WATER QUALITY GUIDELINES

CONDITION	ACCEPTABLE LEVEL		
pH	7 to 9 range for copper. Cupronickel may be used in the 5 to 9 range.		
Total Hardness	Calcium and magnesium carbonate should not exceed 20 grains per gallon (350 ppm).		
Iron Oxides	Less than 1 ppm.		
Iron Bacteria	No level allowable.		
Corrosion*		Max Allowable Level	Coaxial Metal
	Ammonia, Ammonium Hydroxide	0.5 ppm	Cu
	Ammonium Chloride, Ammonium Nitrate	0.5 ppm	Cu
	Ammonium Sulfate	0.5 ppm	Cu
	Chlorine/Chlorides	0.5 ppm	CuNi
	Hydrogen Sulfide†	None Allowable	—
Brackish	Use Cupronickel heat exchanger when concentrations of calcium or sodium chloride are greater than 125 ppm are present. (Seawater is approximately 25,000 ppm.)		

*If the concentration of these corrosives exceeds the maximum allowable level, then the potential for serious corrosion problems exists.

†Sulfides in the water quickly oxidize when exposed to air, requiring that no agitation occur as the sample is taken. Unless tested immediately at the site, the sample will require stabilization with a few drops of one Molar zinc acetate solution, allowing accurate sulfide determination up to 24 hours after sampling. A low pH and high alkalinity cause system problems, even when both values are within ranges shown. The term pH refers to the acidity, basicity, or neutrality of the water supply. Below 7.0, the water is considered to be acidic. Above 7.0, water is considered to be basic. Neutral water contains a pH of 7.0.

NOTE: To convert ppm to grains per gallon, divide by 17. Hardness in mg/l is equivalent to ppm.

Acoustical design

Sound power levels represent the sound produced by the source, the WSHP unit, with no regard to attenuation between the source and the space. Acoustical design goals are necessary to provide criteria for occupied spaces. These goals help ensure that people are comfortable and can communicate effectively over the air conditioning system and other background noise sources.

Acoustical design goals are desirable sound pressure levels within a given conditioned space and are represented by Noise Criteria (NC) curves. Noise Criteria (NC) curve levels represent a peak over a full spectrum of frequencies. A high value in a low frequency band has the same effect on NC level as a lower value in a high frequency band. It is important that sound levels be balanced over the entire spectrum relative to the NC curve. The lower the NC criteria curve, the more stringent the room acoustical design must be to meet the design goals.

It is important to know how to convert the unit ratings from sound power (Lw) to sound pressure (Lp). This conversion depends on the specifics of the installation's acoustic environment.

Assessing an area's acoustical design means comparing the sound pressure (Lp) with the NC curve for the selected area.

Some of the factors that affect conversion of sound power to sound pressure and consequent NC level include:

- Type of acoustical ceiling
- Use of metal or flex duct
- Absorption in the occupied space
- Location in the occupied space
- Open or closed layout plan
- Use of open or ducted returns
- Orientation of unit to occupant
- Use of lined or unlined duct

OCTAVE BAND SOUND PRESSURE LEVEL (Lp) ASSOCIATED WITH NC CURVES

NOISE CRITERIA CURVES	OCTAVE BAND SOUND PRESSURE LEVEL (Lp)							
	Frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
NC-15	49	36	26	17	17	14	12	11
NC-20	52	41	33	27	22	19	17	16
NC-25	54	45	38	31	27	24	22	21
NC-30	58	49	41	36	31	29	28	27
NC-35	61	53	45	40	36	34	33	32
NC-40	64	57	50	45	41	39	38	37
NC-45	67	61	54	49	46	44	43	42
NC-50	71	64	58	54	51	49	48	47
NC-55	74	68	63	58	56	54	53	52
NC-60	77	71	67	63	61	59	58	57
NC-65	80	75	71	68	66	64	63	62

WSHP sound control

Analyzing the projected sound level in the conditioned space caused by a WSHP unit located in a ceiling plenum is quite involved. The key is to have good sound power ratings (Lw) in dB on the equipment to determine the sound attenuation effect of the ductwork, ceiling and room. Aquazone equipment includes standard attenuating features and offers an advanced mute package. In addition, Carrier provides suggestions for unit sound design around the WSHP.

Horizontal units

Use the following guidelines for layout of Aquazone horizontal units to minimize noise:

1. To select quietest equipment, obtain sound power ratings in accordance with latest standards from manufacturers.
2. Do not locate units over a space with a required NC of 40 or less. Instead, locate units above less sensitive noise areas such as above or in equipment rooms, utility closets, restrooms, storage rooms, or above corridors.
3. Provide at least 10 feet between WSHP units to avoid the additive effect of two noise sources.

4. Provide an acoustical pad underneath the WSHP unit in applications where the unit must be mounted above noise sensitive areas such as private offices or conference rooms. The pad attenuates radiated noise. Be sure the pad has an area at least twice that of the WSHP footprint.
5. Maximize the installed height above the suspended ceiling.
6. Be sure the WSHP unit is located at least 6 feet away from any ceiling return grille to prevent line-of-sight casing noise to reach the space below.
7. Suspend the WSHP unit from the ceiling with hangers that use spring or neoprene type isolators to reduce vibration transmission.
8. Use flexible electrical connections to the WSHP unit. DO NOT USE NOT RIGID CONNECTIONS.
9. Use flexible loop water and condensate piping connections to the WSHP unit.
10. Use a canvas duct connector to connect the WSHP discharge to the downstream duct system. This reduces vibration-induced noise.
11. Provide acoustic interior lining for the first 20 feet of discharge duct, or until the first elbow is reached. The elbow prevents line-of-site sound transmission in the discharge duct.
12. Provide turning vanes in ductwork elbows and tees to reduce air turbulence.
13. Size the sheet metal supply duct with velocities no greater than 1000 fpm.
14. Ensure ductwork is rigid.
15. Use round duct whenever possible to further reduce noise.
16. Allow at least 3 equivalent duct diameters of straight duct upstream and downstream of the unit before allowing any fittings, transitions, etc.
17. Seal all penetrations around duct entering the space.
18. Provide a 4-ft run-out duct made of flexible material to connect a diffuser to the supply trunk duct. The flex duct provides an "attenuating end-effect" and reduces duct-transmitted sound before it reaches the space. Flex duct typically reduces sound by 6 dB.
19. Locate the run-out duct balancing damper as far away from the outlet diffuser as possible. Locating the balancing damper at the trunk duct exit is best.
20. If return air is drawn through a ceiling plenum, provide an acoustically lined return duct elbow or "L" shaped boot at the WSHP to eliminate line-of-sight noise into the ceiling cavity and possible through ceiling return air grilles. Face the elbow or boot away from the nearest adjacent WSHP unit to prevent additive noise.
21. Do not hang suspended ceiling from the ductwork.

Vertical units

All guidelines established for horizontal units also apply for vertical units. In addition, since vertical units tend to be installed in small equipment rooms or closets, the following additional guidelines apply:

1. Mount the unit on a pad made of high-density sound absorbing material such as rubber or cork. Extend the pad beyond the WSHP unit footprint by at least 6 inches in each direction.
2. Since the unit returns airflow through a grille mounted in a closet door, provide a sound barrier or some other modification of the closet to prevent line-of-sight noise into the conditioned space.
3. Follow good duct design practice in sizing and locating the connection of the WSHP discharge to the supply duct system. Use an elbow with turning vanes bent in the direction of the fan rotation to minimize turbulence. Make any duct transitions as smooth and gradual as possible to again minimize turbulence and loss of fan static pressure.

Solenoid valves

In applications using variable flow pumping, solenoid valves can be field installed and operated from the control board in the Aquazone™ WSHP unit.

Freeze protection

Applications where systems are exposed to outdoor temperatures below freezing (32 F) must be protected from freezing. The most common method of protecting water systems from freezing is adding glycol concentrations into the water. Use design care when selecting both the type and concentrations of glycol due to the following:

- Equipment and performance may suffer with high concentrations of glycol and other antifreeze solutions
- Loss of piping pressure may increase greatly, resulting in higher pumping costs
- Higher viscosity of the mixture may cause excess corrosion and wear on the entire system
- Acidity of the water may be greatly increased, promoting corrosion
- Glycol promotes galvanic corrosion in systems of dissimilar metals. The result is corrosion of one metal by the other, causing leaks.

Application data (cont)

TYPICAL UNIT OPERATING PRSSURES AND TEMPERATURES

ENTERING WATER TEMP (F)	WATER FLOW GPM/ TON	COOLING*						HEATING					
		Suction Pressure (psig)	Discharge Pressure (psig)	Super-heat (°F)	Sub-cooling† (°F)	Water Temp Rise (°F)	Air Temp* Drop (°F DB)	Suction Pressure (psig)	Discharge Pressure (psig)	Super-heat (°F)	Sub-cooling (°F)	Water Temp Drop (°F DB)	Air Temp Rise** (°F)
60	1.5	66-75	160-190	10-20	6-16	20-23	20-25	60-70	205-230	10-18	1- 5	12.1-14.0	23-29
	2.3	65-75	145-175	15-25	8-18	12-15	20-25	63-73	210-238	10-18	1- 5	7.2- 9.0	24-30
	3.0	64-74	130-160	20-30	10-20	8-12	20-25	65-75	215-242	10-18	1- 5	5.8- 6.9	25-31
70	1.5	71-82	200-230	10-20	6-16	19-22	19-24	66-72	205-230	15-25	2- 8	14.0-15.2	28-34
	2.3	70-80	185-215	15-25	8-18	12-17	19-24	68-74	210-238	15-25	2- 8	9.0-10.2	30-37
	3.0	69-79	175-205	20-30	10-20	7-12	19-24	70-76	215-242	15-25	2- 8	6.7- 7.9	31-38
80	1.5	75-85	230-260	10-16	5-12	19-22	18-23	68-74	205-230	20-35	2-10	14.2-15.9	32-39
	2.3	74-84	215-245	13-20	7-14	12-17	18-23	70-76	210-238	20-35	2-10	9.9-11.1	33-41
	3.0	72-82	200-230	15-25	8-15	7-12	18-23	72-76	215-242	20-35	2-10	6.9- 8.1	35-42
90	1.5	79-90	260-290	2- 8	1- 8	18-21	17-23						
	2.3	77-88	245-275	5-12	2- 9	10-14	17-23						
	3.0	75-87	230-260	8-16	3-10	6-11	17-23						

*Cooling air and water numbers can vary greatly with changes in humidity.
†Subcooling is based upon the head pressure at compressor service port Capillary Tube Expansion Device.
**Based on Nominal 400 cfm per ton airflow and 70 F EAT heating and 80/67 F EAT cooling.

Guide specifications

Packaged Water Source Heat Pumps

HVAC Guide Specifications

Size Range: **18,200 to 59,000 Btuh Cooling Capacity**
22,000 to 68,000 Btuh Heating Capacity

Carrier Unit: **50RHC, 50RVC**

Part 1 — General

1.01 SYSTEM DESCRIPTION

A. Install Water Source Heat Pumps, as indicated on the plans with capacities and characteristics as listed in the schedule and the specifications that follow. Units shall be Carrier unit 50RHC (Horizontal) or model 50RVC (Vertical) configurations.

B. Units shall be supplied completely factory built and capable of operation with an entering water temperature range from 60 to 95 F.

Equivalent units from other manufacturers can be proposed provided approval to bid is given 10 days prior to bid closing.

C. Units shall be individually packaged with wooden skid covered with protective corner posts and plastic stretch wrapping for maximum protection.

1.02 QUALITY ASSURANCE

A. All equipment listed in this section must be rated in accordance with ARI/ASHRAE/ISO 13256-1 performance standard and CSA. The units shall have ARI/ISO, NRTL, and CSA labels.

B. All units shall be factory tested under normal operating conditions at nominal water flow rates. This testing shall generate a report card to be shipped with each unit stating performance in both Heating and Cooling modes.

C. Serial numbers will be recorded by factory and furnished to contractor for ease of unit warranty status. Units that are tested without water flow rates are not acceptable.

Part 2 — Product

2.01 EQUIPMENT

A. General:

1. The horizontal and vertical heat pumps shall be fabricated from heavy gage galvanized sheet metal. All interior surfaces shall be lined with $1/2$ in. thick, $1\,1/2$ lb acoustic type fiberglass insulation. All fiberglass shall be coated and have exposed edges tucked under flanges to prevent the introduction of glass fibers into the airstream. All insulation must meet NFPA 90A.
2. Units shall be prewired and precharged in factory.

B. Unit Cabinet:

1. Units must be field convertible from side to back or back to side discharge with no additional parts or unit structure modification. Units will have factory-installed hanger brackets and isolation grommets.
2. Horizontal Units shall have one of the following airflow arrangements: Right-Discharge/Left-Return; Left-Discharge/Right-Return; Back-Discharge/Left-Return; or Back-Discharge/Right-Return as shown on the plans.
3. Vertical Units shall have one of the following airflow arrangements: Left-Return/Top-Discharge, Front-Return/Top-Discharge, or Right-Return/Top-Discharge. All vertical units will be supplied from the factory internally trapped.
4. If units with these arrangements are not used, the contractor is responsible for any extra costs incurred by other trades.
5. Cabinets shall have separate openings and knockouts for entrance of line voltage and low voltage control wiring. Contractor must ensure that units can be easily removed for servicing and coordinate locations of electrical conduit and lights with the electrical contractor.
6. All units must have a minimum of three access panels for serviceability of compressor compartment. If other arrangements make servicing difficult, the contractor must provide access panels and clear routes to ease service. Architect must approve any changes in layout.
7. All units must have an insulated panel separating the fan compartment from the compressor compartment.
8. Optional Mute package shall consist of high technology sound attenuating materials that are strategically applied to the cabinet, in addition to the standard system, to further dampen sound.
9. Units with the compressor in the airstream are not acceptable.

C. Fan and Motor Assembly:

1. Units rated 60,000 Btuh and under shall have a direct-drive centrifugal fan. The fan motor shall be 3-speed, permanently lubricated, PSC (permanent split capacitor) type with internal thermal overload protection.
2. Blower shall have inlet rings to allow removal of wheel and motor from one side without removing housing.
3. Units supplied without permanently lubricated motors must provide external oilers for easy service.

4. The fan motor shall be isolated from the fan housing by torsionally flexible isolation grommets. The fan and motor assembly must be capable of overcoming the external static pressures as shown on the schedule.
5. CFM/Static pressure rating of the unit shall be based on a dry coil and a clean filter in place.

D. Refrigerant Components:

1. Units shall have a sealed refrigerant circuit including a highly efficient reciprocating compressor designed for heat pump operation.
2. Units shall have a capillary tube assembly for refrigerant metering, an enhanced aluminum lanced fin and rifled copper tube refrigerant to air heat exchanger, a reversing valve, a coaxial (tube-in-tube) refrigerant-to-water heat exchanger.
3. Hermetic reciprocating compressors shall be internally isolated. The compressor will be mounted on isolating grommets. The grommets will be secured to a heavy gage compressor plate that has rubber grommet isolation from the cabinet base. Compressor shall have thermal overload protection and be located in an insulated compartment away from airstream to minimize sound transmission.
4. Refrigerant-to-air heat exchangers shall use enhanced lanced aluminum fins and rifled copper tube construction rated to withstand 450 psig refrigerant working pressure.
5. Refrigerant-to-water heat exchangers shall be of copper inner-water tube and steel refrigerant outer tube design, rated to withstand 450 psig working refrigerant pressure and 450 psig working water pressure. Plate-to-plate heat exchangers cannot be used.
6. Refrigerant metering shall be accomplished by capillary tube assembly only. Units intended for use in standard operating range with entering water temperatures from 60 to 95 F.
7. Reversing valves shall be four-way solenoid activated refrigerant valves, which shall fail to heating operation should the solenoid fail to function. If the reversing valve solenoid fails to cooling, a low temperature thermostat must be provided to prevent over-cooling an already cold room.
8. Optional cupronickel coaxial water-to-refrigerant heat exchangers.

E. Drain Pan:

The drain pan shall be constructed to inhibit corrosion and be fully insulated. Drain outlet shall be located on pan to allow complete and unobstructed drainage of condensate. Vertical units will have a factory-installed trap inside of cabinet. The standard unit will have solid-state electronic condensate overflow protection. Mechanical float switches are not acceptable.

F. Filter:

1. Units shall have a factory installed 1 in. wide filter bracket for filter removal from either side. Units shall have a 1 in. thick throwaway type fiberglass filter.
2. The contractor shall purchase one spare set of filters and replace factory shipped filters on completion of start-up.
3. Filters shall be standard sizes. If units use non-standard filter sizes then the contractor shall provide 12 spare filters for each unit.
4. Field installed 2 in. filter brackets and 2 in. fiberglass throwaway filters on all units can be installed by contractor.

G. High Static Blower:

Provides increased airflow at various static pressure conditions. Available in all sizes for 50RHC,RVC units.

H. Controls and Safeties:

1. Electrical:
   a. A control box shall be located within the unit compressor compartment and shall contain a 50 va transformer, 24-volt activated, 2 or 3 pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation. Electro-mechanical operation is not acceptable.
   b. Units shall be nameplated for use with time-delay fuses or HACR circuit breakers. Unit controls shall be 24-volt and provide heating or cooling as required by the remote thermostat/sensor.
2. Piping:
   a. Supply and return water connections shall be copper FPT fittings and shall be securely mounted flush to the cabinet corner post allowing for connection to a flexible hose without the use of a back-up wrench.
   b. All water connections and electrical knockouts must be in the compressor compartment corner post as to not interfere with the serviceability of unit. Contractor shall be responsible for any extra costs involved in the installation of units that do not have this feature.
3. Unit Controls:
   a. Safety controls including a high-pressure switch, a low-pressure sensor, and a low water and low air temperature sensor. Access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service.
   b. Activation of any safety device shall prevent compressor operation via a lockout device. The lockout shall be reset at the thermostat or at the contractor-supplied disconnect switch.

c. Units which may be reset only at the disconnect switch only shall not be acceptable.

4. The standard Complete C control electronic control system shall interface with a heat pump (Y,O) wall thermostat (mechanical or electronic). The control system microprocessor board shall be specifically designed to protect against building electrical system noise contamination, EMI, and RFI interference. The control system shall have the following features:
   a. 50 VA transformer.
   b. Performance Monitor (PM). The PM warns when the heat pump is running inefficiently.
   c. Anti-short cycle time delay on compressor operation time delay shall be 5 minutes minimum.
   d. Random start on power up mode.
   e. Low voltage protection.
   f. High voltage protection.
   g. Unit shutdown on high or low refrigerant pressures.
   h. Unit shutdown on low water temperature.
   i. Water coil freeze protection (selectable for water or antifreeze).
   j. Air coil freeze protection (check filter switch).
   k. Condensate overflow shutdown.
   l. Option to reset unit at thermostat or disconnect. Fault type shall be retained in memory if reset at thermostat.
   m. Automatic intelligent reset. Unit shall automatically reset 5 minutes after trip if the fault has cleared. Should a fault reoccur 3 times sequentially then permanent lockout will occur.
   n. Ability to defeat time delays for servicing.
   o. Light-emitting diodes (LEDs) to indicate high pressure, low pressure, low voltage, high voltage, air/water freeze protection, condensate overflow and control status.
   p. The low-pressure switch SHALL NOT be monitored for the first 90 seconds after a compressor start command to prevent nuisance safety trips.
   q. Remote fault type indication at thermostat.
   r. Selectable 24-v or pilot duty dry contact alarm output.
   s. 24-v output to cycle a motorized water valve with compressor contactor.
   t. Electric heat output to control two stages of electric heat.
   u. Service test mode for troubleshooting and service.
5. Optional electronic Deluxe D Control shall have all the features of the Complete C control with the following additional features:
   a. 75 VA transformer.
   b. A removable thermostat connector.
   c. Random start on return from night setback.
   d. Intelligent reversing valve operation for extended life and quiet operation.
   e. Night setback control from low temperature thermostat, with 2-hour override initiated by a momentary signal from the thermostat.
   f. Dry contact night setback output for digital night setback thermostats.
   g. Ability to work with heat/cool (Y, W) thermostats.
   h. Ability to work with heat pump thermostats using O or B reversing valve control.
   i. Single grounded wire to initiate night setback, or emergency shutdown.
   j. Boilerless system control can switch automatically to electric heat at low loop water temperature.
   k. Dehumidistat input providing fan control for dehumidification operating.
   l. Multiple units connected to one sensor providing communication for up to 3 water source heat pumps.
   m. Selection of boilerless changeover temperature set point.
   n. Compressor relay staging for dual stage units or in master/slave applications.
6. Carrier PremierLink™ Controller:

   This optional control will function with CCN and ComfortVIEW™ software. It shall also be compatible with *Comfort*Link™ controllers. It shall be ASHRAE 62-99 compliant and Internet ready. It shall accept a CO_2 sensor in the conditioned space and be Demand Control Ventilation (DCV) ready. The communication rate must be 38.4K or faster. It shall include an integrated economizer controller.

I. Field-Installed Accessories:
   1. Aquazone™ Thermostat Controls:
      a. Programmable multi-stage thermostat with 7-day clock, holiday scheduling, large backlit display and remote sensor capability.
      b. Programmable 7-Day Light Activated Thermostat offers occupied comfort settings with lights on, unoccupied energy savings with lights off.
      c. Programmable 7-Day Flush Mount Thermostat offers locking coverplate with tamper proof screws, flush to wall mount, dual point with adjustable deadband, O or B terminal, and optional remote sensor.

Guide specifications (cont)

d. Programmable 5-Day Thermostat offers 2 stage heat, 2 stage cool, auto changeover, 5-minute built-in compressor protection, locking cover included.

e. Non-programmable Thermostat with 2 heat stages, 2 cool stages, auto changeover, 5-minute built-in compressor protection, locking cover included.

2. Loop Controller with six stages (2 stages for heating and 4 stages for heat rejection).
3. Filter Rack (2 in.) to enhance the filtration system of the water source heat pump.

   NOTE: Filter rack does not include filters.
4. Fire-Rated Hoses kits with a fixed MPT on one end and a swivel with an adapter on the other end. Hose kits can be either stainless steel or galvanized.
5. Ball Valves (Brass Body) for shut off and balancing water flow. Available with memory, with memory stop, and pressure temperature ports.
6. Y Strainers (Bronze Body) "Y" type configuration with a brass cap. Maximum operating pressure rating of 450 psi. Strainer screen made of stainless steel.
7. Solenoid Valves (Brass Body) provide slow operation for quiet system application.
8. Hose Kit Assemblies includes a ported ball valve with pressure temperature (P/T) plug ports, flexible stainless steel hose with swivel and nipple. Return hose includes a ball valve, preset measure flow (gpm) with two P/T ports, flexible stainless steel hose with a swivel and nipple.
9. Remote sensors for Aquazone™ flush-mount thermostats.
10. PremierLink™ accessories for providing a fully integrated DDC system. Accessories include supply air temperature sensors, communicating room sensors, CO_2 sensors, and linkage thermostats.